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A CONTINUING BIBLIOGRAPHY

WITH INDEXES

(Supplement 157)

AUGUST 1976

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ACCESSION NUMBER RANGES

Accession numbers cited in this Supplement fall within the following ranges:

STAR (N-10000 Series)	N76-22150—N76-24142
IAA (A-10000 Series)	A76-28778—A76-31927

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NASA SP-7011 (157)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 157)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in July 1976 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA).*

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INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* (NASA SP-7011) lists 228 reports, articles and other documents announced during July 1976 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of the bibliography was published in July 1964; since that time, monthly supplements have been issued.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects of biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged in two major sections: *IAA Entries* and *STAR Entries*, in that order. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR*, including the original accession numbers from the respective announcement journals. This procedure, which saves time and money, accounts for the slight variation in citation appearances.

Two indexes—subject and personal author—are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1976 Supplements.

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All publications abstracted in this Section are available from the Technical Information Service, American Institute of Aeronautics and Astronautics, Inc. (AIAA), as follows: Paper copies are available at $5.00 per document up to a maximum of 20 pages. The charge for each additional page is 25 cents. Microfiche[1] are available at the rate of $1.50 per microfiche for documents identified by the # symbol following the accession number. A number of publications, because of their special characteristics, are available only for reference in the AIAA Technical Information Service Library. Minimum airmail postage to foreign countries is $1.00. Please refer to the accession number, e.g., (A76-13400), when requesting publications.

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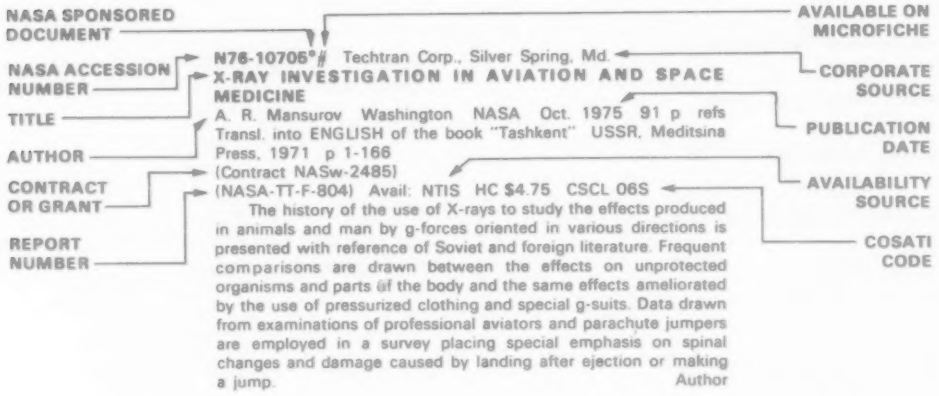
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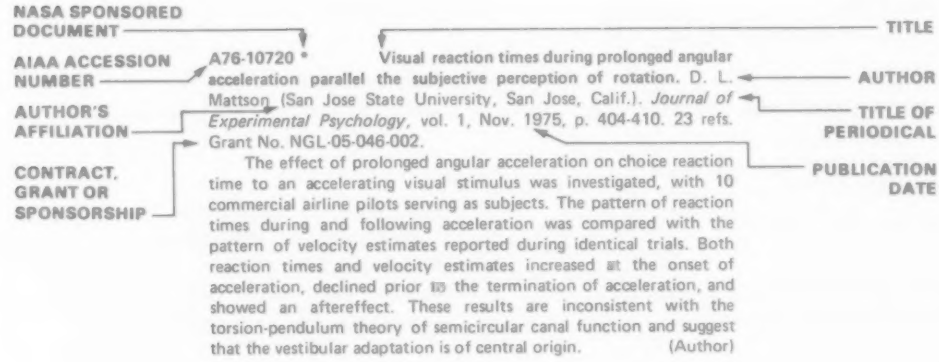
N76-10705*# Techtran Corp., Silver Spring, Md.
X-RAY INVESTIGATION IN AVIATION AND SPACE MEDICINE
A. R. Mansurov Washington NASA Oct. 1975 91 p refs
Transl. into ENGLISH of the book "Tashkent" USSR, Meditsina Press, 1971 p 1-166
(Contract NASw-2485)
(NASA-TT-F-804) Avail: NTIS HC $4.75 CSCL 06S
The history of the use of X-rays to study the effects produced in animals and man by g-forces oriented in various directions is presented with reference of Soviet and foreign literature. Frequent comparisons are drawn between the effects on unprotected organisms and parts of the body and the same effects ameliorated by the use of pressurized clothing and special g-suits. Data drawn from examinations of professional aviators and parachute jumpers are employed in a survey placing special emphasis on spinal changes and damage caused by landing after ejection or making a jump. Author

TYPICAL CITATION AND ABSTRACT FROM *IAA*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A76-10720 * Visual reaction times during prolonged angular acceleration parallel the subjective perception of rotation. D. L. Mattson (San Jose State University, San Jose, Calif.). Journal of Experimental Psychology, vol. 1, Nov. 1975, p. 404-410. 23 refs.
Grant No. NGL-05-046-002.
The effect of prolonged angular acceleration on choice reaction time to an accelerating visual stimulus was investigated, with 10 commercial airline pilots serving as subjects. The pattern of reaction times during and following acceleration was compared with the pattern of velocity estimates reported during identical trials. Both reaction times and velocity estimates increased at the onset of acceleration, declined prior to the termination of acceleration, and showed an aftereffect. These results are inconsistent with the torsion-pendulum theory of semicircular canal function and suggest that the vestibular adaptation is of central origin. (Author)

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 157)

AUGUST 1976

IAA ENTRIES

A76-28814 **New control system with an advanced man/machine interface for Commonwealth Edison Company's system security.** T. C. Cihlar (Commonwealth Edison Co., Chicago, Ill.). In: International Federation of Automatic Control, Triennial World Congress, 6th, Boston and Cambridge, Mass., August 24-30, 1975, Proceedings. Part 2. Pittsburgh, Pa., Instrument Society of America, 1975, p. 17.3 1-17.3 9.

A control system for the supervision and management of the generation and transmission systems of an electric utility is described. A dual LN5500 computer system is maintained in a master-reserve state, with a data link and fail-over logic allowing control to be assumed by the reserve computer in the case of a failure in the master. Each of the two Sigma 5 computers has 48,000 words of memory, expandable to 64,000 words. All system programs are stored on rapid access data storage units and transferred as needed to the core memory. Data acquisition is by means of a dual digital system with analog back-up telemetry. Converted data are displayed by color cathode ray tubes, printers, mapboard, and recorders. In designing the man-machine interface, special attention was given to the elimination of non-pertinent data, resulting in the implementation of management by exception information display techniques. C.K.D.

A76-28843 **Considerations in modeling the human supervisory controller.** T. B. Sheridan (MIT, Cambridge, Mass.). In: International Federation of Automatic Control, Triennial World Congress, 6th, Boston and Cambridge, Mass., August 24-30, 1975, Proceedings. Part 3. Pittsburgh, Pa., Instrument Society of America, 1975, p. 40.2 1-40.2 6. 18 refs.

In a variety of systems the human operator is being removed from that of in-the-loop controller and placed in the position of a supervisory controller. In this mode a computer handles the continuous control of vehicle or plant, closing the loop between sensors of key state variables and control effectors. The human supervisor operates in a higher level loop, playing the key roles of: planning, teaching, monitoring, intervening as an in-the-loop controller when the need arises, and developing trust in the system as warranted. He scans and keeps track of many variables, processes this data relative to his internalized performance criteria, and updates the various computer programs which model and control the ongoing process. This paper describes several areas where supervisory control is becoming applied, discusses the various roles of the supervisor, and reviews theoretical considerations to be considered in modeling these roles. (Author)

A76-28844 **Dynamic characteristics of alcohol-impaired human controllers.** H. R. Jex, D. T. McRuer, R. W. Allen, and R. H. Klein (Systems Technology, Inc., Hawthorne, Calif.). In: International Federation of Automatic Control, Triennial World Congress, 6th, Boston and Cambridge, Mass., August 24-30, 1975, Proceedings. Part 3. Pittsburgh, Pa., Instrument Society of America, 1975, p. 40.3 1-40.3 6. 22 refs. U.S. Department of Transportation Contract No. HS-227-2-288.

Although the operation of vehicles like airplanes and cars involves a complex array of perceptual, decision and control activities, most accident statistics clearly show that intoxicated operators, and not the difficulty of the task itself, are a dominant cause of accidents. This paper summarizes some recent research on the nature of the impairment of operator control under blood alcohol concentrations (BAC) up to 0.16 percent. Alcohol toxicity is shown to be quite specific with respect to visual-motor functions involved in control of a vehicle, and experiments with a generalized workload task and special driving simulator show how these are reflected in terms of changes in operator control parameters such as response latency, gains, stability margins, and coherency. (Author)

A76-28845 **The relevance of the so-called tremor for the control of voluntary movement.** K. O. Linn and G. Vossius (Karlsruhe, Universität, Karlsruhe, West Germany). In: International Federation of Automatic Control, Triennial World Congress, 6th, Boston and Cambridge, Mass., August 24-30, 1975, Proceedings. Part 3. Pittsburgh, Pa., Instrument Society of America, 1975, p. 40.4 1-40.4 6. 20 refs.

The specific properties of a force applied by untrained subjects to perform a tracking task are studied. The problems discussed are those which arise when one assumes the stimulated muscles to be described by their force rather than by their position. It is shown that physiological tremor can be caused by a sampled data control system at a sampling frequency of 8-10 Hz. Only fast (twitch) fibers can stabilize motion at this frequency. Slow fibers are assumed to be part of another control loop arranged in parallel to the fast one. Fast fibers are intended for fast movements and stabilization, whereas slow fibers are involved in prolonged work. S.D.

A76-28846 **Dynamic behaviour of man in case of difficult controlled elements and deterministic disturbances.** K. Henning (Rheinisch-Westfälische Technische Hochschule, Aachen, West Germany). In: International Federation of Automatic Control, Triennial World Congress, 6th, Boston and Cambridge, Mass., August 24-30, 1975, Proceedings. Part 3. Pittsburgh, Pa., Instrument Society of America, 1975, p. 40.5 1-40.5 10. 8 refs.

The dynamic behavior of man as a controller is described for a single closed loop and deterministic disturbance signals. Particular attention is given to control with a dead-time model of the controlled element, along with the effect of the order of the controlled element, underdamped second-order systems, and integrating controlled elements with delay on the dynamic properties of the human communication channel eye-hand described by a quasi-linear model. An idealized model of man as a controller is presented which describes man's adaptability to the dynamics of the controlled element even if control is difficult. S.D.

A76-28847 **An optimization concept of systolic elastance.** E. J. Noldus (Gent, Rijksuniversiteit, Ghent, Belgium). In: International Federation of Automatic Control, Triennial World Congress, 6th, Boston and Cambridge, Mass., August 24-30, 1975, Proceedings. Part 3. Pittsburgh, Pa., Instrument Society of America, 1975, p. 54.4 1-54.4 9. 12 refs.

A new model of left ventricular pumping is proposed which is based on the optimization of the ventricular elastance curve with respect to a simple quadratic performance index selected on an energetic basis. The elastance function is defined as the ratio between the instantaneous values of the left ventricular pressure and volume.

It is found that the form of the predicted pressure and elastance waves is in good agreement with experimental data. In addition, the model is suitable for exact prediction of a number of known experimental findings pertaining to the effects of different loading conditions and system parameters on these waveforms. S.D.

A76-28848 Distributed-parameter-control of human body-temperature. J. Werner (Ruhr-Universität, Bochum, West Germany). In: International Federation of Automatic Control, Triennial World Congress, 6th, Boston and Cambridge, Mass., August 24-30, 1975, Proceedings. Part 3. Pittsburgh, Pa., Instrument Society of America, 1975, p. 54.6 1-54.6 7. 19 refs.

Human thermoregulation is part of a complex control-system, involving circulation, metabolism and respiration. Variables and parameters are locally distributed within the body, so that concentrated-parameter-models do not seem to be adequate descriptions. Therefore the control-loop of human body-temperature is treated as a distributed-parameter-system. The equations of heat-balance are formulated, admitting discontinuities of parameters. Using two succeeding integral-transformations and an expansion with eigen-functions, solutions are found for the closed control-loop. Regarding the stationary as well as the dynamical behavior, the mathematical results are on the whole compatible with experimental results. (Author)

A76-28854 * Stochastic stability and instability of model ecosystems. G. S. Ladde (New York, State University, Potsdam, N.Y.) and D. D. Siljak (Santa Clara, University, Santa Clara, Calif.). In: International Federation of Automatic Control, Triennial World Congress, 6th, Boston and Cambridge, Mass., August 24-30, 1975, Proceedings. Part 3. Pittsburgh, Pa., Instrument Society of America, 1975, p. 55.4 1-55.4 7. 12 refs. Grant No. NGR-05-017-010.

In this work, we initiate a stability study of multispecies communities in stochastic environment by using Ito's differential equations as community models. By applying the direct method of Liapunov, we obtain sufficient conditions for stability and instability in the mean of the equilibrium populations. The conditions are expressed in terms of the dominant diagonal property of community matrices, which is a suitable mechanism for resolving the central problem of 'complexity vs stability' in model ecosystems. As a by-product of this analysis we exhibit important structural properties of the stochastic density-dependent models, and establish tolerance of community stability to a broad class of nonlinear time-varying perturbations. (Author)

A76-28861 Control of legged locomotion robots. M. K. Vukobratovic (Institut za Automatizaciju i Telekomunikaciju, Belgrade, Yugoslavia) and D. E. Okhotsimskii (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR). In: International Federation of Automatic Control, Triennial World Congress, 6th, Boston and Cambridge, Mass., August 24-30, 1975, Proceedings. Part 3. Pittsburgh, Pa., Instrument Society of America, 1975, p. P.6 1-P.6 13. 18 refs.

The paper presents control techniques of inherently dynamically stable and unstable legged locomotion robots. As representative of the first group a six-legged locomotion machine is presented, having multilevel hierarchical type control systems, with some qualities of artificial intellect. As unstable type, biped locomotion systems are discussed. New approach to the synthesis of artificial biped gait is presented, together with control procedures for the cases of small and large perturbations. (Author)

A76-28901 * Lower body negative pressure - The second manned Skylab mission. R. L. Johnson, A. E. Nicogossian, S. A. Bergman, Jr., and G. W. Hoffler (NASA, Johnson Space Center, Houston, Tex.). *Aviation, Space, and Environmental Medicine*, vol. 47, Apr. 1976, p. 347-353. 6 refs.

Results of orthostatic evaluations of the crew of Skylab 3 with lower body negative pressure (LBNP) stress tests during their 59 d mission are reported. Except for an inflight increase (rather than a decrease) in resting heart rates, results were essentially parallel to those observed in crewmen of the shorter Skylab 2 mission. Exaggerated elevations in heart rate and decreases in pulse pressure during LBNP stress inflight and immediately postflight corresponded to lowered orthostatic tolerance. Large decrements in resting calf size inflight and in total leg volume postflight indicated significant headward fluid shifts as had already been seen in the Skylab 2 crewmen. In addition, decreases in calf circumference gave no certain indication of a plateau over the 59 d inflight. Percentage volume increase in calf size during LBNP stress inflight was greater than those in either preflight or postflight tests. (Author)

A76-28902 Quantitative electrocardiography during extended space flight - The second manned Skylab mission. R. F. Smith, P. H. King (Vanderbilt University, Nashville, Tenn.), K. Stanton, D. Stoop, and W. Janusz (U.S. Naval Aerospace Medical Center, Aerospace Medical Institute, Pensacola, Fla.). *Aviation, Space, and Environmental Medicine*, vol. 47, Apr. 1976, p. 353-359. 12 refs.

Vector electrocardiograms were obtained for the second Skylab crew before, during, and after the 59-day flight period. Observations were made at rest, before, during, and after 25%, 50% and 75% of maximum excercise, and during a short pulse of exercise. A statistically significant increase in QRS maximum vector magnitude during flight was found. The increase resembled ECG changes associated with athletic conditioning and may be related to increased ventricular volume secondary to centripetal shifts of fluid or to the in-flight exercise program. An increase in the PR interval at rest suggests that there was increased vagal tone or suppressed sympathetic influence during the flight. No major changes in QRS, T, or ST vector direction occurred. C.K.D.

A76-28903 * Pre- and postflight systolic time intervals during LBNP - The second manned Skylab mission. S. A. Bergman, Jr., G. W. Hoffler, R. L. Johnson, and R. A. Wolthuis (NASA, Johnson Space Center; Technology, Inc., Houston, Tex.). *Aviation, Space, and Environmental Medicine*, vol. 47, Apr. 1976, p. 359-362. 11 refs.

Before and after the 59 day Skylab 3 flight, the astronauts were stressed with lower body negative pressure (LBNP), and their vectorcardiograms, pneumograms, phonocardiograms, and carotid pulse tracings were monitored together with the intervals of systole. In the immediate postflight period elevations in heart rate and blood pressure were observed in response to -50 mm Hg of LBNP. Postflight abnormalities in the systolic time intervals (STI) at rest and during stress were due to an increase in afterload and a decrease in preload. As blood volume was restored and blood pressure reduced, STI abnormalities persisted as long as one month, suggesting a possible reduction in ventricular contractility and/or a functional impairment to venous return. C.K.D.

A76-28904 * Determination of cardiac size following space missions of different durations - The second manned Skylab mission. A. Nicogossian, G. W. Hoffler, R. L. Johnson, and R. J. Gowen (NASA, Johnson Space Center, Houston, Tex.; U.S. Air Force Academy, Colorado Springs, Colo.). *Aviation, Space, and Environmental Medicine*, vol. 47, Apr. 1976, p. 362-365. 8 refs.

A simple method to estimate cardiac size from single frontal plane chest roentgenograms has been described. Pre- and postflight chest X-rays from Apollo 17, and Skylab 2 and 3 have been analyzed for changes in the cardiac silhouette size. The data obtained from the computed cardiothoracic areal ratios compared well with the clinical cardiothoracic diametral ratios ($r = .86$). Though an overall postflight decrease in cardiac size is evident, the mean difference was not statistically significant ($n = 8$). The individual decreases in the cardiac silhouette size postflight are thought to be due to decrements in intracardiac chamber volumes rather than in myocardial muscle mass. (Author)

-28905 * **Exercise cardiac output following Skylab mis- - The second manned Skylab mission.** M. C. Buderer, D. G. ldin (Technology, Inc., Houston, Tex.), J. A. Rummel, E. L. hel, and C. F. Sawin (NASA, Johnson Space Center, Biomedical earch Div., Houston, Tex.). *Aviation, Space, and Environmental licine*, vol. 47, Apr. 1976, p. 365-372. 17 refs.

Cardiac output was measured during preflight and postflight rcise-stress tests on the Skylab astronauts. In the postflight tests nediately following the 28-, 59-, and 84-d earth orbital missions, astronauts exhibited an approximate 30% decrease in cardiac put coupled with an approximate 50% decrease in cardiac stroke me during exercise. These changes were accompanied by elevated rt rates and significant increases in total systemic peripheral cular resistance. Mean arterial pressure was unchanged. All ameters returned to normal preflight values within 30 d of the of the orbital period. Duration of the zero-G exposure did not ear to influence either the magnitude of the hemodynamic nges or the time-course of their return to normal. These results discussed in relation to other cardiovascular findings and possible chanisms responsible for the observations are outlined. (Author)

-28906 * **Sleep monitoring - The second manned Skylab sion.** J. D. Frost, Jr. (Methodist Hospital; Baylor University, uston, Tex.), W. H. Shumate, C. R. Booher (NASA, Johnson ce Center, Houston, Tex.), and J. G. Salamy (Technology, Inc., uston, Tex.). *Aviation, Space, and Environmental Medicine*, vol. Apr. 1976, p. 372-382. 25 refs. Contract No. NAS9-12974.

Sleep patterns were monitored in one subject aboard each of the nned Skylab missions. In all three subjects stage 3 sleep increased ing the flight and consistently decreased postflight. Stage REM elevated, and REM latency decreased in the late postflight iod. The number of awakenings remained the same or decreased ing flight. No changes were observed which could be expected to ersely affect performance capability. C.K.D.

6-28907 * **Hematology and immunology studies - The ond manned Skylab mission.** S. L. Kimzey (NASA, Johnson Space nter, Cellular Analytical Laboratory, Houston, Tex.), P. C. nnson (Baylor University, Houston, Tex.), S. E. Ritzman (Texas, iversity, Galveston, Tex.), and C. E. Mengel (Missouri, University, lumbia, Mo.). *Aviation, Space, and Environmental Medicine*, vol. Apr. 1976, p. 383-390. 26 refs.

The hematologic and immunologic functions of the Skylab 3 ronauts were monitored during the preflight, inflight, and post- ght phases of the mission. Plasma protein profiles showed high nsistency in all phases. A transient suppression of lymphocyte ponsiveness was observed postflight. A reduction in the circulating od volume due to drops in both the plasma volume and red cell ss was found. The loss of red cell mass is most likely a suppressed ythropoiesis. The functional integrity of the circulating red cells d not appear to be compromised in the course of flight. C.K.D.

6-28908 * **Mineral and nitrogen balance study observa- ns - The second manned Skylab mission.** G. D. Whedon, J. Reid ational Institutes of Health, National Institute of Arthritis, tabolism, and Digestive Diseases, Bethesda, Md.), L. Lutwak alifornia, University, Los Angeles; U.S. Veterans Administration spital, Sepulveda, Calif.), P. C. Rambaut, M. W. Whittle, M. C. nith, C. Leach (NASA, Johnson Space Center, Biomedical Research r., Houston, Tex.), C. R. Stadler, and D. D. Sanford (Technology, c., Houston, Tex.). *Aviation, Space, and Environmental Medicine*, l. 47, Apr. 1976, p. 391-396.

A metabolic study of important body elements, particularly ose of the musculoskeletal system, was carried out on the tronauts of the Skylab 3 mission during the preflight, inflight, and stflight phases. An elevation in the level of urinary calcium similar that observed in the 28-d Skylab flight continued throughout the ght. Significant nitrogen and phosphorus losses, apparently sociated with muscle tissue loss, occurred in spite of inflight ercise programs. On the basis of these results it is predicted that pable musculoskeletal function is likely to occur in flights longer an about 9 months in duration. C.K.D.

A76-28909 * Bone mineral changes - The second manned Skylab mission. J. M. Vogel (California, University, Davis, Calif.) and M. W. Whittle (NASA, Johnson Space Center, Houston, Tex.). *Aviation, Space, and Environmental Medicine*, vol. 47, Apr. 1976, p. 396-400. 9 refs.

The mineral content of the central os calcis, and distal radius and ulna was measured by the monoenergetic photon absorptiometric technique pre- and postflight on the SL-3 crewmen. No significant changes were observed in the radius and ulna. Only the SPT showed a loss in calcaneal mineral which slowly returned to preflight levels by the 87th postflight day. (Author)

A76-28910 * Measurement of a single tendon reflex in conjunction with a myogram - The second manned Skylab mission. J. T. Baker (Technology, Inc., Houston, Tex.), A. E. Nicogossian, G. W. Hoffler, and R. L. Johnson (Technology, Inc.; NASA, Johnson Space Center, Houston, Tex.). *Aviation, Space, and Environmental Medicine*, vol. 47, Apr. 1976, p. 400-402. 8 refs.

A generalized hyperreflexia was observed in Skylab 2 crew members immediately postflight. Duration of the Achilles reflex was significantly shortened. Further shortening was observed on the fourth day after recovery. At the 16th and 29th postrecovery days a lengthening of the reflex was observed in two of the three crew members. The muscle potential intervals were shortened immediately postflight and remained shortened throughout the 29 day postflight evaluation period. C.K.D.

A76-28911 * Metabolic and endocrine studies - The second manned Skylab mission. C. S. Leach (NASA, Johnson Space Center, Biochemistry and Endocrinology Laboratories, Houston, Tex.), P. C. Johnson (Baylor University, Houston, Tex.), and P. C. Rambaut (U.S. Public Health Service, Food and Drug Administration, Washington, D.C.). *Aviation, Space, and Environmental Medicine*, vol. 47, Apr. 1976, p. 402-410. 18 refs.

Complete metabolic collections were performed on the Skylab 3 crew in the preflight, inflight, and postflight phases of the mission. Changes in fluid and electrolyte balance have been correlated with weight loss, changes in the excretion of aldosterone, vasopressin, and fluid compartments. The initial changes observed were consistent with an increase in thoractic blood volume upon transition to a zero gravity environment, producing a net fluid loss. Compensatory mechanisms reestablished positive water balance. The indicators investigated returned to thin preflight levels during the recovery period postflight. C.K.D.

A76-28912 * Biostereometric analysis of body form - The second manned Skylab mission. M. W. Whittle, R. E. Herron, and J. R. Cuzzi (NASA, Johnson Space Center; Texas Institute for Rehabilitation and Research, Houston, Tex.). *Aviation, Space, and Environmental Medicine*, vol. 47, Apr. 1976, p. 410-412.

Results of biostereometric analyses of the body form of the Skylab 3 crew before and after flight. The Cartesian coordinates of numerous points on the body surface were derived by stereophotogrammetry, and mathematical analysis of the coordinate description allowed computation of the surface area and volume of the body, the volume of body segments, and the area and shape of cross sections. The weight loss in all three crew members was accompanied by a loss in volume distributed between the trunk and legs, with the legs showing the greatest proportional loss. The observed loss of volume apparently resulted from a combined loss of fluid in the abdomen and legs, of muscle in the legs and paraspinal region, and of fat in the abdomen and buttocks. C.K.D.

A76-28913 * Crew health status and monitoring summary - The second manned Skylab mission. P. Buchanan (NASA, Kennedy Space Center, Biomedical Office, Cape Canaveral, Fla.). *Aviation, Space, and Environmental Medicine*, vol. 47, Apr. 1976, p. 413-418.

The evaluation of available medical data to determine the health status of the Skylab 3 crew members is discussed. The utilization of raw data from medical experiments during the course of the mission as a source of near-real time criteria for monitoring crew health is

described. The percentage change of selected metabolic parameters, including calorie intake, Na intake, K intake, urine output, water intake, and body weight, from their pre-flight values, vectorcardiographic data, and results of the lower body negative pressure experiment provided a core of information upon which clinical judgements could be made. Minor clinical problems occurring during the mission are outlined. C.K.D.

A76-28914 Medical legacy of Skylab as of May 9, 1974 - The manned Skylab missions. C. A. Berry (Texas, University, Houston, Tex.). *Aviation, Space, and Environmental Medicine*, vol. 47, Apr. 1976, p. 418-424.

The results of biomedical studies carried out during the Skylab program are summarized. Total results indicate that crew members were able to adjust successfully to their zero G environment during long-term space flight, and that complete readaptation to the 1G environment occurred within a reasonable period postflight. No increase in the loss of red blood cell mass beyond 15% was observed with increasing mission duration. Cardiovascular responses returned to normal more rapidly with increasing mission length. Calcium losses appear to be continuous, reflecting the results of bedrest studies. No abnormalities of cellular function have been observed. There is evidence of negative nitrogen balance during prolonged space flight. The implications of the medical data for the planning of long-term manned missions are considered. C.K.D.

A76-28915 Laboratory investigation of 'biorhythms'. D. E. Neil and F. L. Sink (U.S. Naval Postgraduate School, Monterey, Calif.). *Aviation, Space, and Environmental Medicine*, vol. 47, Apr. 1976, p. 425-429. 6 refs.

Three subjects were tested on an information processing task on a daily basis for a period of 70 d. Performance measurement included reaction time, movement time, and information processing rate. The data set obtained was subjected to Fast Fourier Transforms in an attempt to identify periodicities in performance. Twelve significant harmonics were identified and nine were found to be within 1 d of at least one of the cycles hypothesized by the theory of 'biorhythms.' The probability of this occurring by chance is remote, assuming a uniform distribution of significant amplitude. The results were interpreted as suggesting the possibility of a biorhythmic influence in the performance of the task. (Author)

A76-28916 Review of the effects of infrasound on man. C. S. Harris, H. C. Sommer, and D. L. Johnson (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio). *Aviation, Space, and Environmental Medicine*, vol. 47, Apr. 1976, p. 430-434. 37 refs.

Claims that infrasound adversely affects human performance makes people 'drunk,' and directly elicits nystagmus, have not been clearly demonstrated in any experimental study. The effects obtained at low intensity levels of 105 to 120 dB, if they can be substantiated at all, have been exaggerated. Recent well-designed studies conducted at higher intensity levels have found no adverse effects of infrasound on reaction time or human equilibrium. The levels at which infrasound becomes a hazard to man are still unknown. However, the hazardous levels are certain to be much higher than have been suggested in some of the literature. The preliminary exposure limits which were proposed several years ago for use in the U.S.A. are still considered safe and adequate based on present knowledge. Caution is necessary in future research because artifacts produced by faulty experimental procedures can suggest genuine psychological or physiological effects. (Author)

A76-28917 Braking saccade - A new fast eye movement. L. F. Dell'Osso (U.S. Veterans Administration Hospital, Miami, Fla.) and R. B. Daroff (Miami, University, Miami, Fla.). *Aviation, Space, and Environmental Medicine*, vol. 47, Apr. 1976, p. 435-437. 11 refs.

A new type of fast eye movement (FEM) is described whose main function is to stop a runaway slow eye movement (SEM). It conforms to the velocity-amplitude relationship characteristic of other types of saccades. The identification of this FEM is the result of examination of the many waveforms manifested by subjects with congenital nystagmus. It is a common, repeatable phenomenon present in all subjects with any of six different types of nystagmus waveform. The fact that braking saccades reset SEM to zero velocity, whereas no other type of saccade interacts with SEM, indicates a developmental mechanism in such subjects. (Author)

A76-28918 Visual accommodation variations during Trans-Atlantic cockpit duties. H. A. Backman (Pierrefonds Medical Center, Montreal, Canada). *Aviation, Space, and Environmental Medicine*, vol. 47, Apr. 1976, p. 438-440. 14 refs.

Twenty airline pilots measured their near point of accommodation employing a modified Princes' Rule. Measurements were performed periodically traveling east- and west-bound. Five clerical control subjects performed the same measurements over 2 consecutive days. The ranges of variability of the nearpoint of accommodation were compared between the two groups, directions and days. No statistically significant differences in the variability of accommodation were found in the comparisons. (Author)

A76-28919 ECG monitoring of heart failure and pilot load/overload by the Vesla Seat Pad. C. W. Sem-Jacobsen (EEG Research Institute, Oslo, Norway). *Aviation, Space, and Environmental Medicine*, vol. 47, Apr. 1976, p. 441-444.

The Vesla Seat Pad is an ECG monitoring sensor having a pair of highly conductive, flexible metallic panels arranged on a nonconductive waterproof sheet or carrier. ECG signals are transmitted by the subject's perspiration to the sensor device when the subject is seated upon the pad or when a portion of his body is resting on the pad. Experimental evaluations indicate that the device could provide a useful warning system of cardiac impairment in pilots. In the case of failure the co-pilot is alerted to take over by an alarm. C.K.D.

A76-28921 Economical oxygen-delivery system. R. M. Olson (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aviation, Space, and Environmental Medicine*, vol. 47, Apr. 1976, p. 449-451.

Onboard oxygen-generating systems are being developed which could support an aircrew if oxygen produced by these systems were used conservatively. These experiments studied the conservation potential of a rebreather bag placed in a vented container near the regulator in an oxygen-delivery system. The bag's volume was close to that of the subject's physiologic dead space. When the subject exhaled, oxygen in the mouth, trachea, and mask dead space went to the rebreather bag, to be rebreathed with the next breath. The CO_2 contaminated oxygen from the alveoli was vented to the cabin. The dead-space oxygen could be separated from contaminated oxygen because dead-space air is exhaled first with each breath. When the rebreather-bag volume matched the subject's physiologic dead space so that no CO_2 accumulated, a 30% oxygen savings was realized. When the bag was large enough to realize a 50% savings, CO_2 accumulation was only 2%. (Author)

A76-29033 # Analysis of models for the study of the interaction between electromagnetic fields and biological tissues in order to evaluate exposure risks (Analisi dei modelli per lo studio dell'interazione tra campi elettromagnetici e tessuti biologici ai fini della valutazione dei rischi di esposizione). P. Bernardi and F. Giannini (Roma, Università, Rome, Italy). *Alta Frequenza*, vol. 45, Mar. 1976, p. 167-176. 24 refs. In Italian. Research supported by the Consiglio Nazionale delle Ricerche.

A76-29180 Computer characterization of sinus rhythm. A. R. LeBlanc, R. A. Nadeau (Medical Research Council, Ottawa; Ecole Polytechnique, Montreal, Canada), and F. A. Roberge (Montréal, Université, Montreal, Canada). *Journal of Electrocardiology*, vol. 9, Apr. 1976, p. 115-122. 15 refs. Research supported by the Quebec Heart Foundation, Ministère de l'Education du Québec, and Medical Research Council of Canada.

Sinus rhythm tracings, including sinus tachycardia and bradycardia, are characterized quantitatively by means of an ECG measurement program which has been subjected to rigorous evalua-

The analysis is performed on tracings of short duration (10 sec). features of regularity and stability are considered for the R train. Regularity is evaluated from the normalized differences een successive RR intervals. Stability is determined by the ratio naximum and minimum RR interval durations. Due to the culties of automatic beat-to-beat detection and measurement of aves, an estimate of the PR interval is obtained from a pseudo-PR val determined from certain features of the P and R wavetrains. constancy of this pseudo-PR interval is evaluated, and its olute value is used as a characteristic of the type of sinus rhythm. (Author)

-29181 **Angular velocity of the QRS loop of the orcardiogram in the normal heart.** E. Fletcher and S. Bekheit xas, University, Houston, Tex.). *Journal of Electrocardiology*, 9, Apr. 1976, p. 129-132. 10 refs.

Angular velocity expressed in radians/sec of the rotation vement of the QRS loop at intervals of 2.5 msec was calculated m a computer program written in FORTRAN IV. Frontal, izontal and left sagittal planes were recorded in 125 normal jects for analysis. The range of angular velocity for 375 QRS ps was from a few radians/sec to a maximum of 95 radians/sec. erage values of maximum angular velocities were: frontal plane, 2 radians/sec, horizontal plane, 41 radians/sec, and left sagittal ne, 34.1 radians/sec. Angular velocity expressed as a periodic nction of the vector loop is characterized by polyphasic curves. In frontal plane, curves tend to be more symmetrical with ximum values in the middle. Angular velocity curves are an ernate expression of analysis of planar vector loops employed in nical practice. Their normal ranges are given. (Author)

76-29182 **An easily applied and removed dry annular ction electrode.** L. A. Geddes (Purdue University, West Lafayette, d.), A. G. Moore (Baylor University, Houston, Tex.), R. Baker, and Mack. *Journal of Electrocardiology*, vol. 9, Apr. 1976, p. 55-159. 17 refs. Research supported by Purdue University.

A new type of self-retaining dry metal electrode for the ectrocardiogram (ECG) is described which adheres to the skin by e application of negative pressure to an annulus surrounding the ectrode, which is of bare silver. Data are presented for the factors hich govern the adherence to the skin and the range of initial mpedance and the values obtained at 2, 5, 10, and 20 minutes and ith tap water under the electrodes. The initial impedance is usually gh (0.18 to 10 megohms) and decreases progressively with time. ap water placed under the electrodes dramatically reduces the itial range of impedance. Such electrodes, when used with an mplifier with an adequately high input impedance, can be used for cording electrocardiograms in a variety of situations. (Author)

A76-29183 **Sinoventricular conduction in atrial standstill.** A. M. Ross (U.S. Veterans Administration Hospital, West Haven, Conn.), M. C. Proper, and A. L. Aronson (Yale University, New Haven, Conn.). *Journal of Electrocardiology*, vol. 9, Apr. 1976, p. 161-164. 16 refs.

Sinoventricular rhythm implies preserved sinus node function with conduction of impulses to the A-V junction without generalized atrial excitation. Impulse propagation in such cases is presumably via specialized internodal tracts. In this present case, synchronized but localized activation from an area of the right atrium preceded each QRS, without generalized atrial depolarization. These recordings are offered as further evidence for the clinical occurrence of sino-ventricular rhythm in humans. (Author)

A76-29197 **Incidence and significance of left anterior hemiblock complicating acute inferior wall myocardial infarction.** P. Kourtesis, E. Lichstein, K. D. Chadda, and P. K. Gupta (City Hospital Center, Elmhurst; Mount Sinai School of Medicine, New York, N.Y.). *Circulation*, vol. 53, May 1976, p. 784-787. 25 refs.

A76-29199 **Effect of infra-aortic balloon counterpulsation on the motion and perfusion of acutely ischemic myocardium - An experimental echocardiographic study.** R. E. Kerber, M. L. Marcus, J. Ehrhardt, and F. M. Abboud (Iowa, University; U.S. Veterans Administration Hospital, Iowa City, Iowa). *(American Physiological Society, Annual Meeting, San Francisco, Calif., Oct. 1975.) Circulation*, vol. 53, May 1976, p. 853-859. 18 refs. Research supported by the Iowa Heart Association; Grant No. NIH-HL-14388.

A76-29276 **The vestibular system.** Edited by R. F. Naunton (Chicago, University, Chicago, Ill.). New York, Academic Press, Inc., 1975. 487 p. $24.50.

The present collection of papers is concerned with the ultrastructure, physiology, and electronystagmography of the vestibular system, with particular reference to diseases of the peripheral and central vestibular systems due to nuclear lesions, motion sickness, and drugs. The vestibular pathways to the cerebellum, the spinal cord, and the nuclei of the extraocular muscles are reviewed. Current knowledge on peripheral mechanisms and the functional relations between the vestibular system, cerebellum, oculomotor system, spinal cord, and cortex is presented. Examination of the vestibular labyrinths is discussed, along with estimation of the caloric test applied to the vestibular system and neuro-otological radiology. Numerous panel discussions are included. S.D.

A76-29277 **Some aspects of the structure of the vestibular apparatus.** C. A. Smith and K. Tanaka (Oregon, University, Eugene, Ore.). In: The vestibular system. New York, Academic Press, Inc., 1975, p. 3-20. 23 refs. Grant No. NIH-NS-1345.

Anatomical features of the vestibular system in the guinea pig which are revealed by electron microscope, SEM, and TEM techniques are reviewed. The discussion covers the vestibular sensory areas localized in five specific regions, namely the two maculae and the three cristae. Each of the receptor organs is composed of supporting and sensory cells arranged in a compact mass. There is an obvious difference in length between the hair bundles on the cristae and maculae. Also discussed are the innervation of the sensory cells, the otolithic membranes, and the cupulae which are composed of much finer fibrils than the otolithic membranes. The cupulae and otolithic membranes are far more susceptible to preparation artifacts, since they are extracellular with no covering membrane structure which might lend stability. The regularity of the cavities in the otolithic membranes suggests that they represent channels into which the hair bundles are inserted. The stereocilia in many hair bundles in the saccule are much shorter than those in the utricle. S.D.

A76-29278 **The innervation of the vestibular labyrinth.** R. R. Gacek (Harvard University, Cambridge, Mass.). In: The vestibular system. New York, Academic Press, Inc., 1975, p. 21-29. 14 refs.

Afferent and efferent innervation of the vestibular labyrinth as revealed by microscopic techniques and horseradish peroxidase injected into the labyrinth are described. In afferent innervation, the innervation to each of the cristae of the semicircular canals is almost equal, and the innervation to the utricle is slightly greater than each of the ampullary nerves. Two populations of afferent vestibular nerve fibers are identified: a smaller population of large neurons which terminate on Type I hair cells and a larger population of small fibers which innervate Type II hair cells. The location of the semicircular canal neurons in the rostral portion of the vestibular nerve and the otolith neurons in the caudal portion gives some indication of their different central terminations within the vestibular nuclei. The innervation from the two maculae course in the caudal portion of the nerve where the interstitial nucleus of the vestibular nerve does not exist. The peripheral course of the efferent pathway is identified, but the origin of these fibers has not been clarified until recently. S.D.

A76-29279 **Anatomical aspects of the functional organization of the vestibulospinal pathways.** R. Nyberg-Hansen (Oslo, Universitetet, Oslo, Norway). In: The vestibular system. New York, Academic Press, Inc., 1975, p. 71-93; Discussion, p. 93-96. 95 refs.

Impulses of vestibular origin may be transmitted to the spinal cord through three different descending projections: the lateral and medial vestibulospinal and the reticulospinal pathways, all of which being located in the ventral or ventrolateral funiculus of the cord. The lateral vestibulospinal pathway originates from the lateral vestibular nucleus and descends somatotropically organized in the ipsilateral ventral funiculus throughout the cord; it terminates mainly on interneurons in laminae VII-VIII. The medial vestibulospinal pathway takes origin from the medial and probably to a minor extent from the descending vestibular nucleus. It descends bilaterally within the medial longitudinal fasciculus to midthoracic cord levels and terminates in laminae VII-VIII, more densely than the lateral pathway. The reticulospinal pathways originate from the nucleus reticularis pontis caudalis and nucleus reticularis gigantocellularis of the medulla oblongata. Pontine fibers terminate in laminae VII-VIII, whereas medullary fibers end mainly in lamina VII. Physiological characteristics of all these pathways are discussed. S.D.

A76-29280 **Physiology of the vestibular nuclei.** V. J. Wilson (Rockefeller University, New York, N.Y.). In: The vestibular system. New York, Academic Press, Inc., 1975, p. 109-127. 76 refs. Grants No. NIH-NS-02619; No. NIH-NS-05463.

The functional organization of the lateral (Deiters'), medial, superior, and descending vestibular nuclei of the cat is reviewed. Emphasis is placed on the following aspects of the organization of the nuclei: the nature, excitatory or inhibitory, of neurons in the various nuclei; the projection of cells; and the inputs the latter receive. The vestibular nuclei contain excitatory and inhibitory neurons that contribute to the control of spinal and extraocular motoneurons. Their influence on the spinal cord is produced through two pathways, the lateral and medial vestibulospinal tracts (LVST and MVST), the former excitatory the latter inhibitory and perhaps also excitatory. The LVST originates in Deiters' nucleus and the MVST from the medial vestibular nucleus. The extraocular projection arises in the superior and medial nuclei. Recent evidence indicates that cells in the vestibular nuclear are mostly driven by electrical stimulation of only one of the three ipsilateral semicircular canals, and perhaps only by a canal or an otolith afferent. S.D.

A76-29281 **Vestibulo-spinal relationships.** O. Pompeiano (Pisa, Università, Pisa, Italy). In: The vestibular system. New York, Academic Press, Inc., 1975, p. 147-180. 218 refs. Research supported by the Consiglio Nazionale delle Ricerche; Grant No. NIH-NS-07685-05.

Relevant aspects of the vestibulospinal and spinovestibular relations are reviewed. Particular attention is devoted to effects mediated by the lateral and medial vestibulospinal tracts, effects mediated through the reticular formation, the impact of the vestibular labyrinth on the spinal cord, and extralabyrinthine effects on vestibulospinal mechanisms. Also discussed are vestibular influences on ascending spinal pathways, somatotensory spinal influence on vestibular nuclei, and somatotensory influence on supraspinal descending mechanisms involving the vestibular nuclei and the cerebellum. Concomitantly ascending spinal volleys may influence the activity of vestibular nuclei either directly through the ascending spinal afferents terminating within the vestibular nuclei or indirectly through more diverse pathways involving the reticular formation and the cerebellum. S.D.

A76-29282 **Vestibulo-cortical projection.** J. M. Fredrickson and D. W. F. Schwarz (Toronto, University, Toronto, Canada). In: The vestibular system. New York, Academic Press, Inc., 1975, p. 203-210. 50 refs.

Cortical zones that receive a primary vestibular input are examined. Two systematically different neocortical fields which meet the criteria for a primary vestibular projection are identified in various mammalian species. The field which appears to have developed earlier during evolution is located in the transition zone between sensory and motor cortex (area 3a in the squirrel monkey) and is believed to participate in motor function. The second vestibular field which was discovered earlier is located posterior to the first somatotensory field (parietal lobe in the rhesus monkey), and its presumptive function is conscious integrated perception of body position and movements. A thalamic relay nucleus located within the nucleus ventralis posterior inferior is only known for the latter field. S.D.

A76-29283 **Vestibular problems in space flight.** W. H. Johnson (Toronto, University, Toronto, Canada) and A. Graybiel (U.S. Naval Aerospace Medical Research Laboratory, Pensacola, Fla.). In: The vestibular system. New York, Academic Press, Inc., 1975, p. 211-217. 26 refs.

Space sickness experienced by Soviet and American astronauts during space flights is discussed. With transition into weightlessness the stimulus to the otolithic receptors due to gravity vanishes and presumably this is a decisive precondition that makes some persons susceptible to motion sickness. In a rotating environment, head movements that are out of the plane of rotation of the spacecraft generate cross-coupled angular accelerations which result in an abnormal sensory input. Preadaptation involves the execution of head movements under simulated flight conditions. Some vestibular problems still exist and await solution from orbiting research laboratories. S.D.

A76-29284 **On the physiology and the examination of the vestibular labyrinths.** L. B. W. Jongkees (Amsterdam, University, Amsterdam, Netherlands). In: The vestibular system. New York, Academic Press, Inc., 1975, p. 227-246. Discussion, p. 246, 247. 25 refs.

The vestibular labyrinth comprises the semicircular canal organ and the otoliths. The semicircular canal organ responds to rotatory accelerations, whereas the normal sensation caused by the otolith is a sensation of position. The fact that the entire labyrinth has developed from a single placode and is a composite of various differently functioning subdivisions suggests that a close cooperation prevails between all the components. The peripheral and central parts of the vestibular system always play their part. The electrophysiology of the vestibular labyrinth is outlined. ENG allows rapid quantitative measurement of a response to clockwise and anticlockwise rotatory stimuli, along with evaluation of otolithic reflexes or the parallel swing. Studies on the caloric nystagmus during a parabolic flight have revealed that caloric response is enhanced with increase of gravitational force. It is shown that the vestibular system is capable of adapting to a stimulus of long duration and that the response may even change its direction when the stimulus becomes weaker. S.D.

A76-29285 **Testing the vestibular system - Value of the caloric test.** L. R. Proctor (Chicago, University, Chicago, Ill.). In: The vestibular system. New York, Academic Press, Inc., 1975, p. 249-258; Discussion, p. 259, 260. 48 refs. Grants No. PHS-2-R01-NS-09613-02; No. PHS-3-R01-NS-03358-11.

The caloric test stimulates the lateral and anterior semicircular canals, depending in a somewhat complicated manner upon the position of the head with respect to gravity. During the caloric test a temperature gradient appears across the lateral semicircular canal which results in a net force acting to displace the endolymph-cupula system. Control of irrigating fluid temperature does not necessarily ensure control of stimulus strength. There are two phenomena which may greatly modify caloric responses and hence complicate the evaluation of vestibular disease in a specific patient. The first is rapid alteration in the pattern and intensity of nystagmus which may occur unpredictably in any response. The second is the more sustained modification of responses which occurs in some healthy subjects and in the presence of disease. Susceptibility of caloric-induced nystagmus to alteration by the central nervous system provides a sensitive

means to monitor central nervous system activity. The value of the caloric test can be improved by resolving the uncertainties concerning the stimulus magnitude. S.D.

A76-29286 **Positional nystagmus.** H. O. Barber (Toronto, University, Toronto, Canada). In: The vestibular system. New York, Academic Press, Inc., 1975, p. 303-317; Discussion, p. 317-319. 18 refs.

Positional nystagmus with different characteristics occurs under many conditions, both normal and pathologic. Brief comments about etiology are presented. Aschan's (1961) classification of positional nystagmus into three types (Type I - nystagmus persistent, direction changing; Type II - nystagmus persistent, direction fixed in all head positions; and Type III - nystagmus transitory) is clinically useful, especially under test conditions. Suitable tests to detect positional nystagmus with eyes open and closed are described. It is shown that positional nystagmus with eyes open or with Frenzel's glasses is virtually always pathologic, whereas with eyes closed it may or may not be pathologic. The finding, when pathologic, presumably indicates a lesion of the vestibular system. Some cautious inferences on localization may be made from the character of the nystagmus. When significant positional nystagmus is detected by ENG with eyes closed and effective mental alerting, it should generally be regarded as a nonspecific vestibular disorder with little value in localization. Management of paroxysmal positional nystagmus of benign paroxysmal type after head injury is discussed. S.D.

A76-29287 **Vestibular ototoxicity.** J. E. Hawkins, Jr. and R. E. Preston (Michigan, University, Ann Arbor, Mich.). In: The vestibular system. New York, Academic Press, Inc., 1975, p. 321-348; Discussion, p. 348, 349. 103 refs. Research supported by the Upjohn Co. and Eli Lilly and Co.; Grants No. PHS-NS-05065; No. NIH-NS-05785.

The effects of streptomycia (SM) on the vestibular and visual systems in tuberculous patients are examined. It is shown that the unusual disturbance of equilibrium and vision experienced by patients receiving prolonged treatment with SM is attributable to vestibular hypoexcitability and loss of function as a result of injury to the neuroepithelia of the ampullar cristae and the maculae of the utricle and saccule. Lesions of the VIIIth nerve, brainstem, and cerebellum have been described, but they appear to have been caused by tuberculous menengitis of by secondary degeneration. Recent evidence suggests that SM and other vestibulotoxic antibiotics may not affect the hair cells directly, but may act first on the secretory areas, including the dark cells and the planum semilunatum. Some clinical implications are discussed on the basis of the evidence that the ototoxic action of SM and its relatives is exerted on the vestibular end organs and not on the vestibular nuclei and central pathways. S.D.

A76-29288 **Motion sickness and other vestibulo-gastric illnesses.** K. E. Money and W. S. Myles (Defense and Civil Institute of Environmental Medicine, Toronto, Canada). In: The vestibular system. New York, Academic Press, Inc., 1975, p. 371-375; Discussion, p. 375-377. 5 refs.

The major signs and symptoms of motion sickness are malaise, pallor, cold sweating, nausea, and vomiting. The discussion covers the susceptibility, etiology, consideration of motion sickness and vestibulogastric illness as an evolutionary anomaly, and adequate therapy for motion sickness. It is well established that motion sickness and all other forms of vestibulogastric illness do not occur in individuals lacking the inner ear or with the VIIIth cranial nerve sectioned. The structures involved are identified as the vestibular apparatus, the vestibular nerve, the vestibular nuclei, the vestibular parts of the cerebellum (especially the uvula and nodulus), the chemoreceptor emetic trigger zone, the vomiting center, and the nerves and muscles involved in vomiting. An analysis of heavy water nystagmus is made to shed light on the mechanism of positional alcohol nystagmus. Discrete stimulation of the semicircular canals is found to be sufficient to cause vestibulogastric illness. S.D.

A76-29289 **Pathology of the peripheral vestibular system in the human.** J. R. Lindsay (Chicago, University, Chicago, Ill.). In: The vestibular system. New York, Academic Press, Inc., 1975, p. 379-394; Discussion, p. 394, 395. 17 refs.

The histopathology of the most common peripheral vestibular lesions observed by light microscopy in man is reviewed. The lesions are etiologically grouped according to genetically determined pre- and peri-natal disorders (aplasia, hypoplasia, mutations, hypoplasia and degeneration, and heredodegeneration), acquired pre- and peri-natal disorders (viral infection, ototoxic drugs, and teratogenesis), and acquired post-natal disorders including tumors, blood dyscrasia with hemorrhage, diseases of the otic capsule, and head trauma and inner ear concussion. Vestibular degeneration and hearing compensatory effects are discussed. Numerous histopathologic illustrations involving the peripheral vestibular system are presented. S.D.

A76-29399 **Interference with line-orientation sensitivity.** G. Westheimer, K. Shimamura, and S. P. McKee (California, University, Berkeley, Calif.). *(Optical Society of America, Meeting, Boston, Mass., Oct. 22, 1975.) Optical Society of America, Journal,* vol. 66, Apr. 1976, p. 332-338. 8 refs. Grants No. NIH-EY-00220; No. NIH-EY-00360.

Sensitivity for inclination detection of a foveally seen line is exceedingly high. It is shown that appropriately structured visual stimuli can interfere with the inclination detection threshold, presumably by inhibiting some neural signals before they are channeled to interact with others of their ensemble. The parameters of this inhibition, and by implication those of the sensitivity of the involved neural elements, are outlined: spatial location, time course, movement sensitivity, dichoptic nature, nonrecurrent characteristics, and position rather than orientation dependency. (Author)

A76-29400 **Visual sensitivity of the eye to infrared laser radiation.** D. H. Sliney, R. T. Wangemann, J. K. Franks (U.S. Army, Environmental Hygiene Agency, Aberdeen Proving Ground, Md.), and M. L. Wolbarsht (Duke University, Durham, N.C.). *Optical Society of America, Journal,* vol. 66, Apr. 1976, p. 399-341. 15 refs.

The foveal sensitivity to several near-infrared laser wavelengths was measured. It was found that the eye could respond to radiation at wavelengths at least as far as 1064 nm. A continuous 1064-nm laser source appeared red, but a 1060-nm pulsed laser source appeared green, which suggests the presence of second harmonic generation in the retina. (Author)

A76-29426 **Mechanisms of information processing in sensory systems (Mekhanizmy pererabotki informatsii v sensornykh sistemakh).** Edited by V. D. Glezer. Leningrad, Izdatel'stvo Nauka, 1975. 190 p. In Russian.

The papers collected constitute theoretical and experimental studies of information processing in various sensory systems of the organism, including nervous mechanisms of processing visual, aural, vestibular, and proprioceptive signals, as well as certain aspects of the physiology of mechanical, electrical, and thermal reception. Some of the topics covered include temperature signalization and its processing, signal transformation by the semicircular canals of the vestibular apparatus, spectral characteristics of complex receptive fields of the visual cortex, neuron models of spatial frequency filtering, and an analog model of the structural and functional organization of muscle and its receptor apparatus.

P.T.H.

A76-29427 # **Temperature signalization and its processing in an organism (Temperaturnaia signalizatsiia i ee obrabotka v organizme).** K. P. Ivanov (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). In: Mechanisms of information processing in sensory systems. Leningrad, Izdatel'stvo Nauka, 1975, p. 7-19. 21 refs. In Russian.

The significance of specific heat-sensitive structures such as neurons, intereceptors, and cutaneous thermoreceptors, in heat regulation is examined. Previously unknown functions of these structures are described, and the nature and transmission of temperature signals at various levels of the central nervous system are

discussed. A hypothesis is put forward regarding the general principle of processing temperature signals in an organism and the regulation of thermal homeostasis. It is concluded that temperature signalization from cutaneous thermoreceptors reaches the somatosensory region of the cortex of the large hemispheres having undergone hardly any transformations. The main processing of thermal signals and generation of a controlling signal for the effector part of the thermoregulation system takes place in the hypothalamus. P.T.H.

A76-29428 # **Signal transformation by the semicircular canals of the vestibular apparatus (K voprosu o preobrazovanii signalov polukruzhnymi kanalami vestibuliarnogo apparata).** V. M. Gusev, V. A. Kisliakov, and I. V. Orlov (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). In: Mechanisms of information processing in sensory systems. Leningrad, Izdatel'stvo Nauka, 1975, p. 20-32. 18 refs. In Russian.

The paper reviews the results of significant studies conducted in the past on the hydromechanical interaction among the semicircular canals of the labyrinth, and then describes the chief features of a linear mathematical model of the processes involved in the transformation of angular accelerations by the vestibular apparatus. It is shown that in the labyrinth the mutual hydromechanical effects among the canals take place through the vestibule and the common membraneous limb. P.T.H.

A76-29429 # **Electrical reactions of the auditory region of the cortex of the vermis cerebelli during aural stimulation (Elektricheskie reaktsii slukhovoi oblasti kory chervia mozzhechka pri zvukovoi stimuliatsii).** Ia. A. Al'tman, N. N. Bekhterev, E. A. Radionova, G. N. Shmigidina (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR), and J. Syka (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR; Ceskoslovenska Akademie Ved, Ustav Experimentalni Mediciny, Prague, Czechoslovakia). In: Mechanisms of information processing in sensory systems. Leningrad, Izdatel'stvo Nauka, 1975, p. 57-80. 24 refs. In Russian.

Evoked potentials and activity of single neurons of the auditory region of the vermis cortex under the action of sound were investigated. The experiments established the low sensitivity of cerebellum neurons, in comparison to neurons of the centers of the classical auditory path, to such sound parameters as intensity, duration, and frequency. At the same time, cerebellum neurons demonstrated a similarity to the neurons of the classical auditory system centers with respect to their sensitivity to interaural stimulus differences. P.T.H.

A76-29430 # **Study of the spectral characteristics of complex receptive fields of the visual cortex (Issledovanie spektral'nykh kharakteristik slozhnykh retseptivnykh polei zritel'noi kory).** V. D. Glezer, V. A. Ivamov, N. B. Kostelianets, A. M. Kuperman, and T. A. Shcherbach (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). In: Mechanisms of information processing in sensory systems. Leningrad, Izdatel'stvo Nauka, 1975, p. 91-117. 32 refs. In Russian.

It is shown that a part of the complex receptive fields of the visual cortex in the cat constitutes a number of narrowly tuned filters of spatial frequency filters. The width of the pass band at the 0.5 level on the average attains less than two octaves. The maxima of the frequency characteristics lie in the range 0.3 to 5.0 cycles per degree. The responses of complex receptive fields to gratings of different spatial frequency and to single bands of different width can be predicted on the basis of the spectral analysis of the stimuli. Complex fields have several discharge centers, as opposed to simple ones. Complex fields respond to the grating while simple fields respond to individual bands of the grating. It is suggested that complex fields constitute a neurophysiological correlate of the spatial-frequency channels observed in psychophysiological experiments. P.T.H.

A76-29432 # **Nervous regulation of motor activity (Nervnaia reguliatsiia dvigatel'noi aktivnosti).** N. A. Rokotova (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). In: Mechanisms of information processing in sensory systems. Leningrad, Izdatel'stvo Nauka, 1975, p. 137-159. 28 refs. In Russian.

The paper studies information processing in muscle receptors and its use at the level of segmental control of muscular contraction. It is shown that the discharge frequency of individual muscle afferents in narcotized cats reflects a fixed muscle length and tension, and also indicates the beginning, process, and ceasing of muscular extension. On the basis of experiments with the muscle vibroresponse and the characteristics of muscular responses to supraspinal stimuli, it is shown that supraspinal influences constitute finer and more exact controlling actions compared to influences going from muscle receptors along the segmental ring. P.T.H.

A76-29433 # **Modeling the structural-functional organization of muscle and its receptor apparatus (Modelirovanie strukturno-funktsional'noi organizatsii myshtsy i ee retseptornogo apparata).** S. P. Romanov (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). In: Mechanisms of information processing in sensory systems. Leningrad, Izdatel'stvo Nauka, 1975, p. 160-184. 35 refs. In Russian.

On the basis of structural relationships and the properties and functions of various muscle elements and muscle receptor apparatus as revealed in physiological experiments, a model of the structural and functional organization of muscle is constructed on an analog modeling medium. A hypothesis is confirmed regarding the dependence of the discharge frequency in afferents of muscle tension receptors on the physical properties of muscle fibers and the properties of receptor formations. The model operates in real time, which enables immediate comparison of results of model and experimental results. P.T.H.

A76-29476 **Visual and Motion Simulation Conference, Dayton, Ohio, April 26-28, 1976, Proceedings.** Conference sponsored by the American Institute of Aeronautics and Astronautics. New York, American Institute of Aeronautics and Astronautics, Inc., 1976. 156 p.

A systematic approach to visual system requirements and developments is discussed along with an air-to-ground visual display system, a visual generation system for air-to-ground weapon delivery simulation, an engineering simulator for the design of visual flight training simulators, and the effect of visual-motion time delays on pilot performance in a pursuit tracking task. Attention is also given to air combat maneuvering training in a simulator, the effect of simulator fidelity on engine failure training in the KC-135 aircraft, visual space perception on a computer graphics night visual attachment, difference thresholds for judgments of sink rate during the flare, and future trends and plans in motion and force simulation development in the air force. G.R.

A76-29477 # **A systematic approach to visual system requirements and developments.** R. J. Heintzman and D. A. Shumway (USAF, Simulator Div., Wright-Patterson AFB, Ohio). In: Visual and Motion Simulation Conference, Dayton, Ohio, April 26-28, 1976, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1976, p. 1-12.

Approaches for defining visual simulation requirements are considered. A visual system analysis is conducted and the methods used to translate training requirements into simulator visual hardware are examined. It is pointed out that in the military domain there are no standard visual requirements and, therefore, no standard visual systems. Attention is given to mission considerations, visual system displays, camera/model image generation, aspects of computer image generation, and film image generation. Visual system development needs are discussed together with the implications of these needs for future investigations. G.R.

76-29482 # Motion perception and terrain visual cues in combat simulation. E. A. Stark (Singer Co., Simulation Products v., Binghamton, N.Y.). In: Visual and Motion Simulation Conference, Dayton, Ohio, April 26-28, 1976, Proceedings. New York, American Institute of Aeronautics and stronautics, Inc., 1976, p. 39-49. 15 refs. Contract No. 33657-72-C-0639.

Evaluations were made of a terrain visual simulation system and multicompartmented, g-sensitive seat in an air combat simulator. hese systems provided some of the cues associated with high-erformance air combat maneuvers. A relatively simple checkerboard splay provided visual cues which supported realistic practice in the ntrol of altitude, altitude rate, heading, ground velocity and rate of osure with the surface of the simulated terrain. The G-seat pplemented cues provided by the cockpit motion system, ermitting fine control of sustained accelerations and realistic sponse to minute but critical flight path and attitude deviations. ach system represented only a part of the information available in tual flight, in its area of simulation and yet each provided enough nformation to support complex pilot performance nearly equivalent o that expected in the aircraft. (Author)

76-29483 # A pilot model with visual and motion cues. R. Curry, L. R. Young (MIT, Cambridge, Mass.), W. C. Hoffman Aerospace Systems, Inc., Burlington, Mass.), and D. L. Kugel USAF, Flight Dynamics Laboratory, Wright-Patterson AFB, Ohio). : Visual and Motion Simulation Conference, Dayton, Ohio, April 6-28, 1976, Proceedings. New York, American stitute of Aeronautics and Astronautics, Inc., 1976, p. 50-54. 8 fs. Contract No. F33615-75-C-3069.

A model of pilot control performance is developed to account or the effects of motion cues and external visual (VMC) cues. The arting point for the model is the optimal control model of the uman operator, which has been well validated in fixed-base IMC e.g., instrument cues) situations. The first goal was to incorporate notion cues by augmenting the controled-state vector with the ynamic description of the vestibular sensory organs (semicircular anal and otolith). Comparison of the model predictions with xperimental results of motion only tracking indicates that the oise/signal ratio for the vestibular measurements can be modeled as pproximately -18 dB. This new model was applied to a VTOL overing task and did an excellent job of describing the control erformance with and without motion cues, both on an absolute and elative basis. The model provides a good description of control erformance with and without motion and VMC cues, and predicts he change in scanning behavior observed under these conditions. (Author)

A76-29484 * # The effect of visual-motion time delays on pilot performance in a pursuit tracking task. G. K. Miller, Jr. and D. R. Riley (NASA, Langley Research Center, Hampton, Va.). In: Visual and Motion Simulation Conference, Dayton, Ohio, April 26-28, 1976, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1976, p. 55-62. 6 refs.

A study has been made to determine the effect of visual-motion time delays on pilot performance of a simulated pursuit tracking task. Three interrelated major effects have been identified: task difficulty, motion cues, and time delays. As task difficulty, as determined by airplane handling qualities or target frequency, increases, the amount of acceptable time delay decreases. However, when relatively complete motion cues are included in the simulation, the pilot can maintain his performance for considerably longer time delays. In addition, the number of degrees of freedom of motion employed is a significant factor. (Author)

A76-29485 # Comparison between a peripheral display and motion information on human tracking about the roll axis. A. M. Junker (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio) and D. Price (USAF, Institute of Technology, Wright-Patterson AFB, Ohio). In: Visual and Motion Simulation Conference, Dayton, Ohio, April 26-28, 1976, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1976, p. 63-72. 7 refs.

A comparative study of the effects of peripheral display information and motion cue information on roll axis tracking was performed. It has been shown that similar motion information improves tracking performance for some roll axis tracking tasks. For the motion case the cues available consisted of angular acceleration or velocity and linear acceleration. The peripheral display was driven by plant roll rate giving the human operator angular velocity information only. The same input forcing function and plant dynamics were used for the motion case and the peripheral display case so that comparisons could be made. The tracking results indicate an equivalent improvement in performance for both cases suggesting that angular velocity information was the principal motion component used by the human controller. The results also suggest that peripheral displays can be used to enhance tracking in much the same way as motion cues for tracking performance. (Author)

A76-29486 # Air combat maneuvering training in a simulator. C. W. Meshier (Vought Corp., Dallas, Tex.) and J. P. Roberts (USAF, Tactical Fighter Weapons Center, Nellis AFB, Nev.). In: Visual and Motion Simulation Conference, Dayton, Ohio, April 26-28, 1976, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1976, p. 73-82.

The Aerial Combat Engagement Simulation (ACES) program of the U.S. Tactical Air Command is considered. The program involves the use of a fixed-base visual fighter simulator as a training device to improve the combat skills for operational fighter pilots. The tasks to be simulated are partly related to the employment of radar missiles, heat-seeking missiles, and the 20 mm cannon. Overhead projectors provide each pilot with a computer-generated image of the threat aircraft, a horizon and ground plane, and the F-4E lead computing optical sight system. The effectiveness of the ACES program is evaluated on the basis of the experience which has been obtained in one year of training. G.R.

A76-29487 # The effect of simulator fidelity on engine failure training in the KC-135 aircraft. O. H. DeBerg, B. P. McFarland, and T. W. Showalter (USAF, Aeronautical Systems Div., Wright-Patterson AFB, Ohio). In: Visual and Motion Simulation Conference, Dayton, Ohio, April 26-28, 1976, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1976, p. 83-87.

Because of the dangers associated with engine failures during takeoff of large multiengine aircraft, flight simulators are usually used to train pilots to recover from this failure. An assessment of the effectiveness of this training was made using an engineering flight simulator with KC-135A aircraft commanders as test subjects. Results indicate: (1) the superiority of training effectiveness with simulator visual systems, (2) the enhancement of training effectiveness by including a motion system in the training simulator, and (3) the synergistic improvement in training using both motion and visual systems together. (Author)

A76-29488 * # Visual space perception on a computer graphics night visual attachment. E. Palmer and J. Petitt (NASA, Ames Research Center, Moffett Field, Calif.). In: Visual and Motion Simulation Conference, Dayton, Ohio, April 26-28, 1976, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1976, p. 88-95. 8 refs. Grant No. NGL-05-046-002.

A series of experiments was conducted to compare five psychophysical methods of measuring how people perceive visual space in simulators. Psychologists have used such methods traditionally to measure visual space perception in the real world. Of the five tasks - objective-size judgments, angular-size judgments, shape judgments, slant judgments, and distance judgments - only the angular-size judgment task proved to be of potential use as a measure of simulator realism. In this experiment pilots estimated the relative

angular size of triangles placed at various distances along a simulated runway. Estimates made when the display was collimated were closer to real-world performance than estimates made with an uncollimated display. (Author)

A76-29489 * # **Difference thresholds for judgments of sink rate during the flare.** E. Palmer and J. Petitt (NASA, Ames Research Center, Moffett Field, Calif.). In: Visual and Motion Simulation Conference, Dayton, Ohio, April 26-28, 1976, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1976, p. 96-100. 6 refs. Grant No. NGL-05-046-002.

Past studies have shown that touchdown rates of descent (sink rates) are higher in aircraft simulators than in aircraft under similar conditions. The objective of this paper was to use a psychophysical technique to investigate a pilot's ability to distinguish between two different sink rates close to the ground. The pilots observed a collimated computer graphics display of a typical runway with edge, zone, and centerline lights. The results showed that with a forward velocity of 120 knots, pilots could reliably distinguish between a sink rate of 0.5 m/sec (1.7 ft/sec) and 0.9 m/sec (2.9 ft/sec). The results also showed that the absolute rate of sink did not significantly affect the perception of sink rate. Time of sink and total height drop during the sink did affect the minimum detectable difference between sink rates (the differential threshold). The effects were such that a greater time of sink and greater height drop produced lower thresholds. (Author)

A76-29492 # **The man-rating associated with the AFFDL LAMARS system.** R. L. Schwing (USAF, Flight Dynamics Laboratory, Wright-Patterson AFB, Ohio). In: Visual and Motion Simulation Conference, Dayton, Ohio, April 26-28, 1976, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1976, p. 133-139. 7 refs.

The Large Amplitude Multimode Aerospace Research Simulator (LAMARS) system considered was manufactured by an American aerospace company for the USAF Flight Dynamics Laboratory (AFFDL). A description is given of a safety review, taking into account questions concerning the availability of methods and/or subsystems which protect both personnel and hardware in the event of equipment failure. Built-in safety features are discussed along with operational safety features. Attention is also given to potential operating hazards and future safety considerations. G.R.

A76-29493 # **Future trends and plans in motion and force simulation development in the Air Force.** W. B. Albery, D. R. Gum, and E. D. Hunter (USAF, Human Resources Laboratory, Wright-Patterson AFB, Ohio). In: Visual and Motion Simulation Conference, Dayton, Ohio, April 26-28, 1976, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1976, p. 140-144.

In this paper the Air Force's future trends and plans in motion and force simulation development are presented. A three-fold approach to the problem of providing answers to simulation requirements for the Air Force now and in the future is discussed. The first approach is to take a look at the human and to determine and describe his motion and force sensory mechanisms. Earlier work in sensory mechanism modeling is presented; a new effort, based on an optimal processor model for perception and control is discussed. The second approach, an advanced development program, which includes the design of a second generation G-cueing seat device, is summarized. The third approach, exploratory development, is outlined and the Air Force's engineering experimentation on current G-seat, motion systems, and components as well as joint Air Force/NASA motion studies are presented. (Author)

A76-29495 # **Thresholds to roll motion in a flight simulator.** A. J. Gundry (RAF, Institute of Aviation Medicine, Farnborough, Hants., England). *American Institute of Aeronautics and Astronautics, Visual and Motion Simulation Conference, Dayton, Ohio, Apr. 26-28, 1976, Paper.* 9 p. 43 refs.

Providing effective motion cues requires that we can firstly identify the role of motion in flight simulation, and secondly describe the amount and type of motion necessary to fulfill that role. The author presents an analysis of these problems. One of the first tasks is to define the simple threshold to motion in a flight simulator. Data on roll motion thresholds measured in a small flight simulator is presented. During the normal use of a simulator, the pilot does not have the sole task of detecting motion. He also has to fly the simulator. Data is also presented upon the effects of a concurrent task upon motion thresholds. (Author)

A76-29497 * # **Effect of color on pilot performance and transfer functions using a full-spectrum, calligraphic, color display system.** W. D. Chase (NASA, Ames Research Center, Moffett Field, Calif.). *American Institute of Aeronautics and Astronautics, Visual and Motion Simulation Conference, Dayton, Ohio, Apr. 26-28, 1976, Paper.* 14 p. 8 refs.

The use of blue and red color in out-of-window cockpit displays in full-spectrum calligraphic computer-generated display systems, is studied with attention given to pilot stereographic depth perception and response to visual cues. Displays for vertical approach, with dynamic and frozen-range landing approach and perspective arrays, are analyzed. Pilot transfer function and the transfer function associated with the contrasted approach and perspective arrays are discussed. Out-of-window blue lights are perceived by pilots as indicating greater distance depth, red lights as indicating proximity. The computer-generated chromatic display was adapted to flight simulators for the tests. R.D.V.

A76-29498 # **Preliminary investigation of motion, visual and G-seat effects in the advanced simulator for undergraduate pilot training /ASUPT/.** B. K. Waters, P. M. Grunzke, P. A. Irish, III, and J. H. Fuller, Jr. (USAF, Human Resources Laboratory, Williams AFB, Ariz.). *American Institute of Aeronautics and Astronautics, Visual and Motion Simulation Conference, Dayton, Ohio, Apr. 22-28, 1976, Paper.* 29 p. 21 refs.

This study evaluated motion, field of view (FOV) and G-seat factors in ASUPT under varying environmental conditions. Five maneuvers were flown by three experienced T-37 instructor pilots. Each subject flew 72 takeoffs, ground controlled approaches (GCA), and landings and 360-deg overhead traffic pattern and landings plus 27 slow flights and aileron rolls. Sixty-three dependent variables were measured using automated performance measurement on both system outputs and pilot inputs. System performance was significantly better with no motion vs either 3-deg- or 6-deg-of-freedom motion. Pilot inputs were significantly smoother under no motion conditions. Performance under a 150 deg x 300 deg FOV was significantly better than under a 36 deg x 48 deg FOV. The G-seat improved performance consistently, particularly under the limited FOV. Significant first order interactions emerged between FOV and G-seat factors with the G-seat most beneficial to system output measures when the limited FOV was present, (Author)

A76-29622 # **The psychophysiological preparation of air crews (Psikhofiziologicheskaia podgotovka letnogo sostava).** S. A. Gozulov. *Voenno-Meditsinskii Zhurnal,* Feb. 1976, p. 70-75. 10 refs. In Russian.

The approach used in preparing flight personnel to function with maximum accuracy and efficiency under conditions imposing severe physical and psychological stresses is described. The physical training regime emphasizes development of endurance, coordination, ability to function under conditions of reduced oxygen, and resistance to vestibular disturbance. Survival tactics in the case of mechanical failure and emergency landing in deserted areas are stressed. The psychological preparedness of air crews for the execution of military tasks is ensured by careful development and monitoring of political attitudes and continuous evaluation of the character traits and habits of individual pilots. C.K.D.

A76-29732 # **Oscillation phenomena in the Hodgkin-Huxley quations.** W. C. Troy (Pittsburgh, University, Pittsburgh, Pa.). *Royal ociety (Edinburgh), Proceedings, Section A*, vol. 74, (1974-1975) 976, p. 299-310. 12 refs.

A widely accepted model of nerve conduction in the squid axon the system of four non-linear partial differential equations eveloped by Hodgkin and Huxley (1952). Under space clamp and rrent clamp conditions these equations are reduced to a system of rdinary differential equations. It is found that under appropriate sumptions on the functions and parameters in the resulting fourth rder Hodgkin-Huxley equations there occurs a bifurcation of eriodic solutions from the steady state. This bifurcation takes place s the current parameter passes through a critical value. (Author)

A76-29828 **Vigorous exercise in leisure time, coronary sk-factors, and resting electrocardiogram in middle-aged male civil ervants.** L. Epstein, G. J. Miller, F. W. Stitt, and J. N. Morris Medical Research Council, Social Medicine Unit; London, Uniersity, London, England). *British Heart Journal*, vol. 38, Apr. 1976, . 403-409. 33 refs.

A76-30097 # **Problems of the origin of life (Problemy roiskhozhdeniia zhizni).** A. I. Oparin. *Akademiia Nauk SSSR, Vestnik*, no. 2, 1976, p. 56-60. In Russian.

A large amount of evidence indicating the possibility of abiotic enesis of complex organic molecules has been accumulated as the esult of simulation of conditions believed to be close to those resent in the primitive earth. Study of the abiotic evolution of rganic molecules essential to life in the core of the earth is severely ampered by biological processes; verification of the occurrence of biotic evolution depends on careful studies of extraterrestrial odies, especially asteroids. A major difficulty in considering the volution of life from free organic substances remains the transition rom abiotic to biotic evolution. A possible explanation is the progressive selection of certain materials within the microenvironment of aggregates of organic materials. C.K.D.

A76-30170 # **Remote data processing in computer-aided design in the regime of operative man-machine interaction (Distantsionnaia obrabotka informatsii v IVS-proektirovaniia v rezhime operativnogo vzaimodeistviia 'chelovek-mashina').** N. Ia. Karachentseva and A. E. Guts. *Problemi na Tekhnicheskata Kibernetika*, no. 1-2, 1975, p. 124-129. In Russian.

The paper discusses some general considerations for the laying out of a computer-aided design system featuring man-machine dialogue and data coming from several remote sources. The maximum admissible system reaction time is considered as a critical parameter in the design of the system. For remote display systems, the reaction time is considerably greater than for systems with direct hook-up of display devices to the computer, and depends on the data transmission rate along communication channels and the quantity of data transmitted. The block diagram of a universal complex for remote data transmission for a multidesk design system with telephone communication is discussed. P.T.H.

A76-30171 # **Systems approach in the study of man-machine-environment systems (Sistemen podkhod pri izsledvane na sistemite chovek-mashina-sreda).** N. Naplatanov. *Problemi na Tekhnicheskata Kibernetika*, no. 1-2, 1975, p. 132-136. In Bulgarian.

The paper outlines briefly the basic features of the systems approach to the design of man-machine-environment systems. This class of systems is of the multicircuit and multichannel type characterized by a large network of internal feedback and elements with hierarchical organization and large information flow. The most important characteristics of the operator link are variability, adaptation, fatigue, reliability, and emotionality. Environmental perturbations are identified as being useful or harmful. In the systematic approach to the design of such systems, attention of the ergonomist is drawn to the analysis of the components and basic links of the system and to the means of communication and interaction between them. P.T.H.

A76-30172 # **Choosing the optimum structure for a system of operative graphical interaction between man and the computer (O vybore optimal'noi struktury sistemy operativnogo graficheskogo vzaimodeistviia cheloveka s EVM).** O. I. Semenkov, E. V. Dneprovskii, L. A. Grinshpan, and E. M. Zlotnik. *Problemi na Tekhnicheskata Kibernetika*, no. 1-2, 1975, p. 137-140. In Russian.

The paper discusses some of the principal factors to be considered in the design of an operative graphical system for realizing operative interaction between man and the computer in complex computer-aided design system. The problem of determining the optimal parameters of an operative graphical system is reduced to minimization of a certain target functional, which enables carrying out estimates of organizational variants of the system by rearrangement of procedures by blocks while using software and hardware with different parameters. P.T.H.

A76-30173 # **Automatic measurement and correction of the mean cardiocycle period in ECG monitor analysis systems (Avtomatichno izmervane i korigirane na sredniia period na kardiotsik'la pri sistemite za monitoren analiz na EKG).** Kh. Khristov, G. Astardzhian, L. Simeonova, and Ch. Nachev. *Problemi na Tekhnicheskata Kibernetika*, no. 1-2, 1975, p. 152-157. In Bulgarian.

A76-30174 # **Device for recognition of polytopic extrasystoles for electrocardiogram monitor control systems (Ustroistvo za razpoznavane na politopni ekstrasistoli pri sistemite za monitoren kontrol na elektrokardiogramata).** G. Astardzhiian, T. Ianev, K. Tomov, G. Iovchev, Kh. Khristov, and Ch. Nachev. *Problemi na Tekhnicheskata Kibernetika*, no. 1-2, 1975, p. 158-163. 8 refs. In Bulgarian.

A76-30175 # **Analysis of the cardiovascular system from the viewpoint of automatic control theory (Analiz na s'rdechno-s'dovata sistema ot gledishche ta teoriiata na avtomatichnoto upravlenie).** N. Naplatanov, M. Marinov, and M. Marinov. *Problemi na Tekhnicheskata Kibernetika*, no. 1-2, 1975, p. 164-173. 9 refs. In Bulgarian.

A functional control scheme is drawn up for the cardiovascular system from a systems approach, on the basis of which a theoretical model is proposed which considers the cardiovascular system as a complex one-dimensional automatic control system acting over models of subsystems at a certain level of detail. Subsystems are synthesized in accordance with a problem which is posed regarding the creation of cybernetic methods for diagnosing and treating heart and circulatory diseases. P.T.H.

A76-30234 * **Looking forward to the present.** S. W. Fox (Miami, University, Coral Gables, Fla.). *BioSystems*, vol. 6, 1975, p. 165-175. 32 refs. Grants No. NGR-10-007-008; No. NGR-10-007-088.

The present understanding of the origin of life based on Oparin's (1924) conception of life as a manifestation of matter in a special stage of its development is outlined. The results of chemical analyses of lunar samples are discussed, and their implications regarding chemical reactions beginning with carbonaceous dust are considered. Amino acids isolated from lunar samples taken from different sites show a high degree of similarity, in agreement with the hypothesis that carbon compounds, including amino acid precursors, were implanted on the lunar surface by components of the solar wind. The amino acid precursors are most likely a cyanide compound. Overlapping amino acid/carbon ratios from lunar samples and samples of meteorites suggest a common cosmochemical state of carbon in the solar system. C.K.D.

A76-30237 * **Thermal responses to preoptic heating and ambient temperature in unrestrained rabbits.** G. N. McEwen, Jr. (Illinois, University, Urbana, Ill.; NASA, Ames Research Center, Moffett Field, Calif.) and J. E. Heath (Illinois, University, Urbana, Ill.). *Journal of Thermal Biology*, vol. 1, 1975, p. 23-27. 21 refs. NSF Grant No. GB-13797.

A76-30238 * A multichannel EEG telemetry system utilizing a PCM subcarrier. T. B. Fryer (NASA, Ames Research Center, Moffett Field, Calif.). *Biotelemetry*, vol. 1, no. 4, 1974, p. 202-218. 19 refs.

A multichannel personal-type telemetry system is described that utilizes PCM encoding for the most effective range with minimum RF bandwidth and noise interference. Recent IC developments (COS MOS) make it possible to implement a sophisticated encoding system (PCM) within the low power and size constraints necessary for a personal biotelemetry system. This system includes low-level high-impedance preamplifiers to make the system suitable for EEG recording. (Author)

A76-30261 Human factor and hardware design considerations for passenger protection in high speed crashes. L. O. Wilkins and D. A. Hullender (Texas, University, Arlington, Tex.). *(Arizona State University, International Conference on High Speed Ground Transportation, Tempe, Ariz., Jan. 7-10, 1975.) High Speed Ground Transportation Journal*, vol. 9, Spring 1975, p. 425-433. 16 refs. Research sponsored by the University of Texas.

The paper deals with the identification and summary of significant human factor considerations for restraint and protection of passengers involved in barrier type collisions at speeds up to 300 mph. These considerations result in computed values of minimum stopping distance as a function of initial velocity. The basis of the calculations are upper limits of tolerable deceleration which are a function of impact duration. Two types of lap and shoulder restraint schemes for achieving optimal restraint conditions are described. A totally passive hydraulic/pneumatic shock isolation system for constraining the deceleration levels to acceptable and approximately constant values is described. Typical results of digital computer simulation studies demonstrate the significance of energy dissipation by means of structural deformation of the vehicle. The passive shock isolation system can be utilized to achieve an approximately constant and safe deceleration. (Author)

A76-30343 A model of the human as a suboptimal smoother. W. B. Rouse (Illinois, University, Urbana, Ill.). *IEEE Transactions on Systems, Man, and Cybernetics*, vol. SMC-6, May 1976, p. 337-343. 14 refs. Contract No. F33615-73-C-1238; Grant No. DAAB07-72-C-0259.

Estimation theory is used to develop a model of a human decision maker in a self-paced, visual data smoothing task. The model is basically a noisy fixed-point smoother combined with a weighting function that discounts data in relation to its distance (in time) from the point being smoothed. Experimental data is used to estimate the parameters of the model. Applications of the model to the design of information displays and man-computer interactive decision making systems are considered. (Author)

A76-30368 Gas exchange in man during combined +G/z/ acceleration and exercise. S. A. Nunneley (New York, State University, Buffalo, N.Y.). *Journal of Applied Physiology*, vol. 40, Apr. 1976, p. 491-495. 21 refs. Contracts No. N00014-68-A-0216; No. F44620-72-C-0009; Grant No. NIH-5-P01-HL-14414-03. NR Project 101-722.

Experiments were conducted to examine the effects of leg work at higher acceleration in six male subjects aged 22-27 yr tested in the capsule of a human centrifuge. Each session consisted of six experiments performend in the following order: rest and unloaded pedaling at 1, 2, and 3 G, then rest and 600 kpm/min at 1, 2, and 3 G. It is shown that combining exercise with acceleration has complex effects, in some ways ameliorating the G stress and in others augmenting it. Unloaded pedaling at 2 and 3 G tends to return ventilatory equipment, HR, and O2 pulse toward their 1-G values. The same is true for end-tidal CO2 tension which falls markedly with acceleration and is restored by unloaded pedaling. However, at a given G level, heavier work at 600 kpm/min either makes relatively little difference or causes divergence from control values. These results can be explained in terms of two major effects of exercise, peripheral pumping and increased metabolic rate. S.D.

A76-30369 Effect of substrate on hypoxic response of pulmonary artery. J. F. Souhrada and D. W. Dickey (National Jewish Hospital and Research Center, Denver, Colo.). *Journal of Applied Physiology*, vol. 40, Apr. 1976, p. 533-538. 29 refs.

The response of isolated main pulmonary arteries (MPA) of young guinea pigs to acute hypoxia is studied for MPA incubated in a modified Krebs-Henseleit solution containing either glucose and sucrose, or sucrose alone. In most experiments the MPA is electrically stimulated, whereas in some no electrical stimulation is used. The isometric tension of electrically stimulated MPA is analyzed in terms of resting tension, active tension, and maximum rate of tension development. It is shown that even in the environment of a physiological solution, the pulmonary artery can increase its tone in response to acute hypoxia, this response being dependent on the absence of glucose in the experimental medium. Furthermore, a lower oxygen tension exposure (95 mm Hg) prior to experimental hypoxia potentiates the hypoxic response of the isolated pulmonary artery in a glucose-free medium. Similarly, as in experiments with MPA, the presence of glucose inhibited the hypoxic tonic response of isolated aorta. S.D.

A76-30370 Circulatory effects of prolonged hypoxia before and during antihistamine. J. E. Levasseur, H. A. Kontos, D. W. Richardson, and J. L. Patterson, Jr. (Virginia, Medical College, Virginia Commonwealth University, Richmond, Va.). *Journal of Applied Physiology*, vol. 40, Apr. 1976, p. 549-558. 28 refs. Grants No. DADA-17-67-C-7090; No. NIH-HL-14251-01.

Experiments were carried out to determine the circulatory effects of prolonged hypoxia induced by breathing low concentrations of oxygen in chronically instrumented awake dogs placed in an environmental chamber for five days and to assess the contribution of histamine to the circulatory response to hypoxia, particularly to the pulmonary vasoconstrictor effect of hypoxia. The antihistamine evaluation is done under two different experimental conditions of hypoxia. The effects of H1-receptor blockade with promethazine are studied under conditions of both acute and prolonged hypoxia, while the effects of H2-receptor blockade with metiamide is evaluated only for acute hypoxia. Findings with the use of promethaxine show that circulating histamine is not a major factor in the production of the circulatory response to hypoxia and particularly in the production of the pulmonary vasoconstrictor response to hypoxia. The circulatory response to acute hypoxia in five anesthetized dogs is not modified by intravenous administration of metiamide. S.D.

A76-30371 Posthyperventilation isocapnic hyperpnea. G. D. Swanson, D. S. Ward, and J. W. Bellville (California, University, Los Angeles, Calif.). *Journal of Applied Physiology*, vol. 40, Apr. 1976, p. 592-596. 19 refs. Grants No. NIH-HL-15659; No. NIH-GM-12527.

Subjects voluntarily hyperventilated for 10 breaths. A dynamic end-tidal forcing technique manipulated inspired gases to hold end-tidal CO2-O2 tensions at normal values during the voluntary ventilation period and the postvoluntary ventilation recovery period when the subjects returned to spontaneous breathing. Six of the seven subjects studied exhibited a hyperpnea during the recovery period. Although intersubject and intrasubject variations were evident, the average response for 30 experiments in the six subjects was characterized by an initial drop to 32% of the hyperventilation magnitude followed by an exponential-like decrease with a time constant of 22 sec. This recovery period response is consistent with theoretical properties of neural network and physical oscillators where there is a persistence in the amplitude response after the removal of the stimulus. The recovery period response may be a consequence of cardiodynamic hyperpnea. (Author)

A76-30372 An automated system for assessing metabolic and respiratory function during exercise. J. H. Wilmore, J. A. Davis, and A. C. Norton (California, University, Davis, Calif.). *Journal of Applied Physiology*, vol. 40, Apr. 1976, p. 619-624. 10 refs.

The application of computers to data acquisition and reduction

process in exercise testing has many advantages, including increased accuracy, higher reliability and objectivity, reduced time to complete a test, and fewer technicians necessary to assist in the testing procedure. The present paper describes and evaluates a new system, called the Beckman Metabolic Measurement Cart, designed to provide a totally automated assessment of respiratory and metabolic parameters both at rest and during exercise. Comparisons among three systems demonstrate remarkable agreement, particularly when all potential sources of error for each system are considered. It can be concluded that the biased airflow turbine used performs at least as well as, and possibly even better than, the Parkinson-Cowan gas meter, especially if the gas meter has been used for extended periods of time. S.D.

A76-30373 # **A shower spray facility for accurate control and rapid changes of skin temperature.** G. D. Callin (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio). *Journal of Applied Physiology*, vol. 40, Apr. 1976, p. 641-643. USAF-sponsored research.

A shower spray facility (SSF) was built to closely clamp the skin temperature of human subjects, while retaining capability for controlled rapid changes. The subject is enclosed from the neck down in a small chamber containing three water spray manifolds which terminate in 64 small shower heads; the manifolds provide independent temperature control of left leg, right leg, and arm/torso. A dual, solenoid-switched plumbing system for each manifold allows rapid, preset temperature changes. Preliminary tests showed that single thermocouples can accurately indicate average skin temperature for each of the three controlled body areas. Initial experiments with spikes, step functions, and periodic wave forms have proven the SSF as a potentially powerful tool for studying mechanisms of human thermoregulation. (Author)

A76-30374 * **L-phase variants of Agromyces ramosus.** A. H. Horwitz and L. E. Casida, Jr. (Pennsylvania State University, University Park, Pa.). *Antonie Van Leeuwenhoek*, vol. 41, no. 2, 1975, p. 153-171. 24 refs. Grant No. NGR-39-009-180.

Earlier results suggested that Agromyces ramosus possibly might exist naturally in soil as a cell-wall-defective form. The purpose of the present study was to test this hypothesis by determining whether the laboratory-adapted strains of A. ramosus could be artificially induced into the L-phase and, if so, to examine some parameters affecting induction and the stability of the L-forms. The hypothesis was also tested by attempting to revert the laboratory L-phase strains by subjecting them to the technique originally used for isolation of the bacterial form from soil. It is shown that A. ramosus is easily induced into the L-phase by growing it on an agar media containing low levels of penicillin or glycine. The L-forms are found to be stable after initial contact with the inducing agent and to be unable to be reverted to the bacterial form. However, this lack of reversion does not completely negate the hypothesis that L-forms might occur in nature, because it is possible that L-forms existing in the natural state are less stable than those found in the laboratory where there is little selective pressure toward reversion. S.D.

A76-30395 * **Apparatus and methodology for fire gas characterization by means of animal exposure.** W. H. Marcussen, C. J. Hilado, A. Furst (San Francisco, University, San Francisco, Calif.), H. A. Leon, D. A. Kourtides, J. A. Parker (NASA, Ames Research Center, Moffett Field, Calif.), J. C. Butte, and J. M. Cummins (Northrop Services, Inc., Moffett Field, Calif.). *Journal of Combustion Toxicology*, vol. 3, Feb. 1976, p. 24-31. 7 refs. Grant No. NsG-2039.

While there is a great deal of information available from small-scale laboratory experiments and for relatively simple mixtures of gases, considerable uncertainty exists regarding appropriate bioassay techniques for the complex mixture of gases generated in full-scale fires. Apparatus and methodology have been developed based on current state of the art for determining the effects of fire gases in the critical first 10 minutes of a full-scale fire on laboratory animals. This information is presented for its potential value and use while further improvements are being made. (Author)

A76-30396 * **Relative toxicity of pyrolysis products of some foams and fabrics.** C. J. Hilado (San Francisco, University, San Francisco, Calif.). *(International Conference of Fire Safety, University of San Francisco, San Francisco, Calif., Jan. 12-16, 1976.) Journal of Combustion Toxicology*, vol. 3, Feb. 1976, p. 32-60. 66 refs. Grant No. NsG-2039.

A limited number of foams and fabrics was evaluated in the course of developing test procedures for determining the relative toxicity of materials. The principal variable studied, heating rate, did not affect the relative ranking of the materials tested. Two pyrolysis test procedures using the same basic approach but employing different sample weights, chamber volumes, laboratory animals, heating rates, and upper temperature limits, resulted in identical rankings of relative toxicity. The data obtained show that modification of conventional flexible polyurethane foams with flame retardants to comply with California upholstered furniture flammability regulations seems to consistently reduce toxicity under pyrolysis conditions. (Author)

A76-30397 **Toxicity of solid rocket motor exhaust Effects of HCl, HF, and alumina on rodents.** J. Wohlslagel, L. C. Dipasquale, and E. H. Vernot (California, University, Irvine, Calif.; USAF, Wright-Patterson AFB, Ohio). *Journal of Combustion Toxicology*, vol. 3, Feb. 1976, p. 61-70. 6 refs.

The combustion products formed during the operation of certain solid fuel rocket motors contain large quantities of hydrogen chloride and hydrogen fluoride gases in addition to alumina particles. To determine the hazard associated with this exhaust effluent, LC50 data was obtained on rats and mice exposed for 60 minutes to either HCl or HF. A further series of exposures to combinations of HCl and HF showed no positive or negative interaction of the two compounds to produce a greater or lesser number of deaths than expected. The similar joint action of the two components produced mortalities dispersed about the theoretical probit regression line obtained from a mathematical combination of the individual dose response curves. The addition of alumina dust to concurrent exposures of HCl and HF had no effect on rat or mouse mortality. (Author)

A76-30428 **Plotting movements of manipulatory systems.** A. A. Kobrinskii and A. E. Kobrinskii (Gosudarstvennyi Nauchno-Issledovatel'skii Institut Mashinovedeniia, Moscow, USSR). *(Akademiia Nauk SSSR, Doklady*, vol. 224, Oct. 11, 1975, p. 1030-1033.) *Soviet Physics - Doklady*, vol. 20, no. 10, 1976, p. 660-662. 6 refs. Translation.

The paper deals with the problem of reducing the redundancy of manipulator systems, with redundancy in this case meaning the large number of movement levels of the operating organs (mechanical arms) of the manipulator. Design of the movements of a manipulator refers to an algorithm which permits the computation of variation laws for the generalized coordinates of the manipulator system. This permits the development of a criteria for minimal movement redundancy. B.J.

A76-30429 **Construction of motions of manipulable systems in media containing obstructions.** A. A. Kobrinskii and A. E. Kobrinskii (Gosudarstvennyi Nauchno-Issledovatel'skii Institut Mashinovedeniia, Moscow, USSR). *(Akademiia Nauk SSSR, Doklady*, vol. 224, Oct. 21, 1975, p. 1279-1282.) *Soviet Physics - Doklady*, vol. 20, no. 10, 1976, p. 662-664. Translation.

The problem of the motion of a manipulator consisting of an n-link kinematic chain with tong, moving according to a given law, is studied for the case when some fixed geometrical object D is present in the working space of the manipulator. Positions of the kinematic chain in which its links have points in common with the obstacle are forbidden. It is required to construct in the configuration space of the system a series of manipulator configurations, within the constraints imposed by the obstacle, for which the tong occupies given positions in succession. An algorithm is constructed for solving this problem on the principle of tropism. P.T.H.

A76-30475 # **Effect of enzymatic synthesis of polyadenylic acid on a coacervate system (Vliianie na koatservatnuiu sistemu fermentativnogo sinteza poliadenilovoi kisloty).** A. I. Oparin, A. F. Orlovskii, V. Ia. Bukhlaeva, and K. L. Gladilin (Akademiia Nauk SSSR, Institut Biokhimii, Moscow, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 226, Feb. 1, 1976, p. 972-974. 8 refs. In Russian.

The authors investigated the effect on a protein-carbohydrate coacervate system of a process taking place in it consisting of the synthesis of polyadenylic acid (polyA) from ADP under the action of polynucleotidephosphorylase. The variation of the mean and total volumes of coacervate drops and their number was monitored while polyA synthesis took place in the system. Without the enzyme, drop growth takes place only via coalescence. In the presence of the enzyme, synthesis of polyA takes place actively, and the growth of the total drop volume was proportional to polyA synthesis. Differentiation of drops in a coacervate system while enzyme processes take place may be a factor in prebiological selection of precellular structures. The difference in growth rate and drop structure when polyA synthesis took place in the acervate system, as revealed in the present study, has significance for modeling of primary forms of material exchange. P.T.H.

A76-30476 # **Nuclear histone content in neurons and neuroglias of certain parts of the hypothalamus during cooling of animals (Soderzhanie iadernykh gistonov v neironakh i neiroglii nekotorykh uchastkov gipotalamusa pri dlitel'nom okhlazhdenii zhivotnykh).** A. A. Krichevskaia, L. V. Mogil'nitskaia, and L. Z. Pevzner (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad; Rostovskii Gosudarstvennyi Universitet, Rostov, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 226, Feb. 1, 1976, p. 982-984. 14 refs. In Russian.

A76-30486 # **Thermodynamical properties of polyphosphoinositides in the brain (Termodinamicheskie svoistva polifosfoinozitidov golovnogo mozga).** G. V. Kiselev, L. I. Pavlinova, and D. A. Chetverikov (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 226, Feb. 21, 1976, p. 1455-1458. 12 refs. In Russian.

A polyphosphoinositide molecule contains monoester phosphate groups linked to the inositol ring in the position 4 for diphosphoinositides (DPI) and positions 4 and 5 for triphosphoinositides (TPI). Experiments are conducted to determine the thermal effects of hydrolysis reactions of the monoester phosphate groups of TPI and DPI in the brain tissue. For comparison, hydrolysis is performed under the same conditions for AMP, glucose-1-phosphate, and creatinine phosphate (CP), whose free energy values of hydrolysis are -3 kcal/mole, -5 kcal/mole, and -10 kcal/mole, respectively. The thermal effects are determined using a differential tilting microcalorimeter, and hydrolysis is performed in the presence of an acid phosphatase. During TPI hydrolysis, small amounts of DPI are observed in addition to monophosphoinositides which did not undergo chemical transformations in the absence of the acid phosphatase. A formula is obtained for determining the hydrolysis enthalpy of TPI(4, 5). A major finding is that TPI in the position 5 of the inositol ring contain high-energy phosphate bonds, while DPI and TPI in the position 4 contain 'middle-energy' bonds. S.D.

A76-30495 # **Neuronal organization of the thermosensory region of the anterior hypothalamus (O neironal'noi organizatsii termosensornoi oblasti perednego gipotalamusa).** E. M. Beliavskii (Akademiia Meditsinskikh Nauk SSSR, Leningrad, USSR). *Fiziologicheskii Zhurnal SSR*, vol. 62, Feb. 1976, p. 175-181. 19 refs. In Russian.

In order to elucidate the functional organization of the thermosensory region of the anterior hypothalamus, acute experiments were conducted to study the extracellular activity of 236 neurons in this area of the brain in response to changes in the local temperature within + or - 3 deg from the initial level in anesthetized rabbits, under artificial respiration. It is found that 27% of the neurons exhibit high sensitivity to the temperature change of the brain (among them 15% to heat and 12% to cold). Six percent of the neurons are of the on-response type, whereas 5% of them show a long aftereffect on the temperature stimulus. The possible role of the investigated neurons in the regulation of temperature homeostasis is discussed. S.D.

A76-30496 # **Nystagmus after unilateral lesion of the superior colliculus in rabbits (Nistagm posle odnostoronnego povrezhdeniia verkhnego dvukholmiia u krolikov).** V. P. Neverov and T. F. Kuleshova (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 62, Feb. 1976, p. 196-200. 22 refs. In Russian.

The amplitude-frequency characteristics of optokinetic nystagmus (OKN) and reverse postoptokinetic nystagmus (RPN) were studied in rabbits before and during the first seven days after left-side lesions of the superior colliculi. It is found that after coagulation of the tubercle, OKN frequency is decreased by a factor of 2.7 and the amplitude by a factor of 1.3 during optokinetic stimulation of the right eye. During stimulation of the left eye whose retino-collicular pathway is kept intact, OKN remained unchanged or its frequency increased. The lesion resulted in a more obvious decrease in the frequency and amplitude of OKN than in those of RPN. The retino-collicular pathway seems to be more significant in OKN formation than in the mechanism mediating RPN formation. S.D.

A76-30497 # **Effect of active acclimation to Pamir Highlands on endurance and physical loads (Vliianie aktivnoi akklimatizatsii k vysokogor'iu Pamira na vynoslivost' k fizicheskim nagruzkam).** V. I. Danileiko and V. D. Monogarov (Akademiia Nauk Ukrainskoi SSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologicheskii Zhurnal SSSR*, vol. 62, Feb. 1976, p. 222-229. 37 refs. In Russian.

Five alpinists were examined after a 4-day stay at a camp in the Pamirs (2850 m) and after 14-day active acclimation at altitudes up to 5800 m. Endurance to physical work was determined during exertion with a submaximal intensity on a bicycle ergometer. Prior to and during physical exertion, recordings were made of ECG, indices of external respiration, and magnitudes of HbO2. A major finding was that following acclimation the working capacity of the subjects increased 72% on the average. The results obtained were compared to those of similar investigations conducted in the Caucasus, with emphasis on the activation of oxygen-transporting systems in the human organism. S.D.

A76-30498 # **Changes in the cardiac rhythm and sleep-wakefulness cycle following isoproterenol administration in white rats (Izmeneniia ritma serdtsa i tsikla 'bodrstvovanie-son' u belykh krys posle vvedeniia izoproterenola).** A. A. Snisarenko (Akademiia Nauk SSSR, Institut Fiziologii and Institut Evoliutsionnoi Fiziologii i Biokhimii, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 62, Feb. 1976, p. 236-245. 30 refs. In Russian.

A76-30499 # **Effect of body temperature on biochemical changes in the blood during cold adaptation (Vliianie temperatury tela na biokhimicheskie izmeneniia v krovi pri adaptatsii k kholodu).** L. A. Liakh (Donetskii Gosudarstvennyi Universitet, Donetsk, Ukrainian SSR). *Fiziologicheskii Zhurnal SSSR*, vol. 62, Feb. 1976, p. 294-303. 28 refs. In Russian.

A76-30691 The normal lung (Legkoe v norme). Edited by I. K. Esipova. Novosibirsk, Izdatel'stvo Nauka, 1975. 287 p. In Russian.

The histology and neurohistology of the lung, the ultrastructure of the acinus, and the enzymology of the alveolar epithelium are discussed in detail. Morphology of the normal lung is examined by means of structure-function parallels, with consideration of aeration, gas exchange, and the role of the lungs in circulation and in the exchange of substances. The phylogenesis of lungs is traced from fish to mammals, and the morphogenesis of lungs in mammals is outlined. Chapters are devoted to ontogenesis in the human lung and to examples of the adaptation of the lung structure of certain mammals to environmental stresses. C.K.D.

A76-30703 # **Effects of changing levels of glucocorticosteroids on heat exposure in rabbit.** I. Chowers, N. Conforti, and E. Superstine (Hadassah University Hospital, Jerusalem, Israel). *Japanese Journal of Physiology*, vol. 25, no. 6, 1975, p. 665-676. 22 refs. Research supported by the S. Lunenfeld and R. Kunin Medical Research Foundation.

An experimental study was carried out to evaluate the effect of varying levels of glucocorticosteroids on the ability of unanesthetized rabbits to withstand acute exposure to severe heat and to determine to what extent they are able to maintain a constant body temperature. The animals were divided into six groups: control saline, heat-exposed saline, control dexamethasone, heat exposed dexamethasone, control metopirone, and heat-exposed metopirone. Heat stress consisted in exposing the animals for 1 hr to a temperature of 40 C and a humidity of 35-37%. Rabbits exposed to heat showed elevated plasma osmolality and pH, except for dexamethasone treated animals which exhibited constant plasma osmolality and pH and the smallest rise in rectal temperature compared to the other groups. It is suggested that high levels of glucocorticosteroids are apt to enhance neurogenic and metabolic mechanisms that have protective functions during acute exposure to heat. S.D.

A76-30848 **Latent components in the electrocardiogram.** M. Graham (California, University, Berkeley, Calif.). *IEEE Transactions on Biomedical Engineering*, vol. BME-23, May 1976, p. 220-224. 11 refs. NSF Grant No. GJ-31772.

A new decomposition technique useful for representing a set of observed electrocardiograms is presented. This decomposition is different from past techniques in the constraints placed on the component waveforms in that they must be positive and start, stop, and over-lap in a prescribed manner. The number of component waveforms is dependent on the maximum error tolerated in the reconstruction of the observed waveforms from the component representation. (Author)

A76-30849 **A waveform analyzer applied to the human EEG.** F. F. Klein (Duke University Medical Center, Durham, N.C.). *IEEE Transactions on Biomedical Engineering*, vol. BME-23, May 1976, p. 246-252. 10 refs.

This paper presents an approach to signal waveform analysis in the frequency range of 1 to 50 Hz. The technique is applicable to any waveform which is a single-valued function of time with continuous derivatives. The main application of this system has been in the human EEG. The analyzer, to be described, performs its analysis in the time domain and abstracts wave shape information from the original wave and from the successive mathematical derivatives of that wave. The output from this analyzer consists of six analog descriptors of the input EEG wave. These descriptors are basic amplitude and basic frequency of the original input wave, amplitude and frequency of the first derivative of the input wave, and amplitude and frequency of the second derivative of the input wave. (Author)

A76-30850 * **A first look at the application of signal extraction techniques to the analysis of body surface potential maps.** B. Weinstein (Bell Telephone Laboratories, Inc., Holmdel, N.J.), L. McNeel (National Institutes of Health, Bethesda, Md.), E. Matthews (Howard University, Washington, D.C.), and E. J. Schmann (Howard University, Washington, D.C.; Johns Hopkins University, Baltimore, Md.). *IEEE Transactions on Biomedical Engineering*, vol. BME-23, May 1976, p. 256-262. 14 refs. Grants No. NIH-RR-008016; No. NGR-09-011-055.

Partial body surface potential maps from both normal subjects and subjects with independently diagnosed myocardial infarcts are visually compared from superimposed plots. A correlation test is used to distinguish the two groups, with the reference waveform determined by means of a gradient-search algorithm. The results are encouraging, and suggest further investigation of these techniques as a future diagnostic tool. (Author)

A76-31071 **The development of the visual cortex (Le développement du cortex visuel).** M. Imbert. *La Recherche*, vol. 7, May 1976, p. 480-483. 14 refs. In French.

Results of recent studies of the effects of the environment on the development of the visual cortex are reported. In kittens exposed to a visual environment limited to a specific orientation (horizontal or vertical) during a critical period of their development, the majority of neurons display selectivity of orientation. The effect of the environment during the critical period apparently consists of a selective stabilization of existing synaptic connections. C.K.D.

A76-31107 # **Designing of programmed movements and control of robot manipulator taking into account its kinematic redundancy and dynamics (Podubova programnikh rukhiv i keruvannia robotom-manipuliatorom z urakhuvanniam iogo kinematichnoi nadlishkovosti i dinamiki).** A. V. Timofeev (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). *Avtomatika*, Jan.-Feb. 1976, p. 71-81. 9 refs. In Ukrainian.

Algorithms are suggested for designing programmed movements of a robot-manipulator with obstacles present. The algorithms are based on using the kinematic redundancy of the robot-manipulator. Methods for synthesis of the control laws ensuring the given programmed movement of the manipulator and taking into account the dynamics of the executive drives are also considered. (Author)

A76-31168 # **Optical systems for the study of the hemodynamics in living capillaries.** R. Monti, L. G. Napolitano, and M. Intaglietta (Napoli, Università, Naples, Italy; California, University, San Diego, Calif.). In: Associazione Italiana di Meccanica Teorica ed Applicata, National Congress, 2nd, Naples, Italy, October 16-19, 1974, Proceedings. Volume 4. Milan, Associazione Italiana di Meccanica Teorica ed Applicata, 1974, p. 195-206. 10 refs. Research supported by the Consiglio Nazionale delle Ricerche.

Current optical methods for the 'in vivo' measurement of some of the relevant parameters of the blood circulation in capillaries are examined. An analysis is made for the quantitative computation of all the parameters which can be revealed by high speed cinematography coupled with the intravital microscope, i.e.: dimensions of the vessels, red blood cell velocity, blood mass flow rate and convective fluid exchange through the endothelium. Subsequently the on-line measurement methods of some of these parameters are reviewed with particular reference to the equipment installed at the Bioengineering Laboratory of the Institute of Aerodynamics of the University of Naples. A number of experimental results on the blood velocity in human nailfold are presented. (Author)

A76-31170 # **Design of an experimental apparatus for the study of capillary hemodynamics (Realizzazione di un apparato sperimentale per lo studio della emodinamica capillare).** P. G. Berardi, G. M. Carlomagno, and C. Falconi (Napoli, Università, Naples, Italy). In: Associazione Italiana di Meccanica Teorica ed Applicata, National Congress, 2nd, Naples, Italy, October 16-19, 1974, Proceedings. Volume 4. Milan, Associazione Italiana di Meccanica Teorica ed Applicata, 1974, p. 243-251. 12 refs. In Italian. Research supported by the Consiglio Nazionale delle Ricerche.

An experimental system for the in vivo study of capillary circulation is described, having the capacity to perform measurements of capillary network density and size, red blood cell speed and mass diffusion rates. The base unit is a Leitz-Biomed microscope with beam splitter and optical components which give a maximum magnification of 400x with a resolving power of 0.5 microns. A 100 W halogen lamp or a 250 W mercury lamp can be used to make a Kohler transmitted illumination of the specimen. A closed circuit TV system consisting of a camera with a silicon diode matrix tube mounted on the microscope, a video-recorder and a monitor is used to visualize and store the images of the specimen. Preliminary results of measurements on animal membranes and the human nailfold are presented. B.J.

A76-31179 # **Dynamics of a crash victim - A finite segment model.** R. L. Huston, R. E. Hessel, and J. M. Winget (Cincinnati, University, Cincinnati, Ohio). *(AIAA, ASME, and SAE, Structures, Structural Dynamics, and Materials Conference, 16th, Denver, Colo., May 27-29, 1975, AIAA Paper 75-795.) AIAA Journal*, vol. 14, Feb. 1976, p. 173-178. 38 refs. NSF Grant No. GK-41272; Contract No. N0014-72-A-0027-0002.

A vehicle-occupant, crash-simulation model is developed. The model consists of a finite-segment representation of the human body, together with a vehicle cockpit that includes a seat and crash intrusion surfaces (windshield, doors, etc.). The human body model is constrained to the cockpit by seat and shoulder belts. The equations of motion are developed for the model by using Lagrange's form of d'Alembert's principle. These equations then are coded into a computer program and solved numerically using a fourth-order Runge-Kutta method. Sample motions for several crash situations are presented and discussed. (Author)

A76-31225 # **Experimental ecological systems including a human (Eksperimental'nye ekologicheskie sistemy, vkliuchaiushchie cheloveka).** I. I. Gitel'zon, B. G. Kovrov, G. M. Lisovskii, Iu. N. Okladnikov, M. S. Rerberg, F. Ia. Sid'ko, and I. A. Terskov. Moscow, Izdatel'stvo Nauka (Problemy Kosmicheskoi Biologii, Volume 28), 1975. 312 p. 527 refs. In Russian.

Monograph dealing with life-support systems based on biological circulation of materials, and experimental realization of such systems. Major topics discussed include: closed ecological systems, the human as a link in an experimental ecosystem, potential executive links in closed ecosystems, controlled cultivation of algae, controlled cultivation of higher plants, experimental ecosystems including humans and microflora, microbiological problems concerning closed ecological systems, and an autonomously controlled experimental ecosystem based on the photosynthesis of higher plants and unicellular plants. The physiological reactions of a human inhabiting experimental ecosystems of the types described are reported and analyzed. R.D.V.

A76-31270 # **Lengthening of the reaction time in the presence of short preperiods - The role of sensory factors in its genesis (Udlinenie vremeni reaktsii pri korotkikh predperiodakh - Ob uchastii sensornykh faktorov v ego vozniknovenii).** R. A. Velichkova and A. G. Vasilev (B'lgarska Akademiia na Naukite, Institut po Fiziologiia, Sofia, Bulgaria). *Bolgarskaia Akademiia Nauk, Doklady*, vol. 29, no. 2, 1976, p. 273-276. 8 refs. In Russian.

The reaction time to the second of two visual stimuli presented in rapid succession increases as the interval between the stimuli is decreased. The role of sensory factors in the generation of this phenomenon was investigated. It was found that the effect is more pronounced when both stimuli fall at the same place on the retina than when one falls on the retina and one on the fovea; it has been suggested that this is the result of time limitations in the resolution capacity of the retina, which become more pronounced with increasing distance from the fovea. This effect, however, was found to be slight and present in experiments in which these limitations should be absent. It is concluded that peripheral sensory factors do not significantly influence the relationship between the lengthening effect and the reaction time. C.K.D.

A76-31361 # **Effect of altitude adaptation on human tolerance to some disturbing factors (Vliianie adaptatsii k vysokogor'iu na perenosimost' ispytuemymi nekotorykh vozmushchaiushchikh vozdeistvii).** V. I. Korol'kov, M. M. Mirrakhimov, B. S. Katkovskii, N. A. Agadzhanian, Zh. A. Chotoev, V. M. Mikhailov, Z. M. Kudaberdiev, G. V. Machinskii, and G. F. Shmidt. *Fiziologicheskii Zhurnal SSSR*, vol. 62, Mar. 1976, p. 329-334. 29 refs. In Russian.

Experiments were conducted on 18 healthy subjects aged 18-21 yr to evaluate the effect of motor regime during gradual altitude adaptation on the tolerance to various functional tests (orthostatic, physical, and 'altitude'). The subjects were divided in three groups: (1) the first (control) group was in an unrestrained motor regime during the whole experimental period; (2) the second group was subjected to restrained muscular activity in a strictly horizontal position in bed; and (3) the third group lay in the horizontal position and performed a complex of exercises at two times with a total duration of 40 min. Major findings are an increase in tolerance to acute hypoxia and to physical and orthostatic load in the first-group subjects; a decrease in orthostatic stability and physical working capacity as well as a slight increase in the reserve time for 7500-m stay in an altitude chamber in the second-group subjects; and a decrease in orthostatic stability, an increase in altitude stability, and no change in physical working capacity in the third-group subjects. S.D.

A76-31362 # **Central nystagmus and its interaction with optokinetic and reversible postoptokinetic nystagmi (Tsentral'nyi nistagm i ego vzaimodeistvie s optokineticheskim i reversivnym postoptokineticheskim nistagmami).** V. P. Neverov (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 62, Mar. 1976, p. 362-367. 15 refs. In Russian.

A76-31363 # **Effects of electrical stimulation of vagal nuclei in anesthetized and unanesthetized cats (Effekty elektricheskogo razdrazheniia iader bluzhdaiushchikh nervov u narkotizirovannykh i nenarkotizirovannykh koshek).** S. F. Dugin, S. I. Zakharov, G. E. Samonina, and M. G. Udel'nov (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 62, Mar. 1976, p. 382-386. 16 refs. In Russian.

Experiments were conducted to study the cardiac response of anesthetized and unanesthetized cats to electrical stimulation of the effector nuclei of vagal nerves, i.e., the dorsal nucleus of the vagus nervus and the ambiguous nucleus of the medulla oblongata. It is found that the stimulation of neuron groups whose excitation reduces the heart rate in anesthetized cats brings about an increase in the heart rate of unanesthetized cats in unrestrained activity. A drug-induced blockade of beta-adrenoreceptors revealed the parasympathetic nature of the effects studied. This parasympathetic nature is further supported by the character of the response: short latent period and fast cessation of the effect after removing the acting stimuli. S.D.

A76-31478 * **Applications of space-electrophoresis in medicine.** M. Bier. In: Technology for the new horizon; Proceedings of the Thirteenth Space Congress, Cocoa Beach, Fla., April 7-9, 1976. Cocoa Beach, Fla., Canaveral Council of Technical Societies, 1976, p. 2-1 to 2-6. 29 refs. Contract No. NAS8-29566.

The nature of electrophoresis is reviewed and potential advances realizable in the field of biology and medicine from a space electrophoresis facility are examined. The ground-based applications of electrophoresis: (1) characterization of an ionized species; (2) determination of the quantitative composition of a complex mixture; and (3) isolation of the components of a mixture, separation achieved on the basis of the difference in transport rates is reviewed. The electrophoresis of living cells is considered, touching upon the following areas: the separation of T and B lymphocytes; the genetic influence on mouse lymphocyte mobilities; the abnormal production of specific and monoclonal immunoproteins; and the study of cancer. Schematic diagrams are presented of three types of electrophoresis apparatus: the column assembly for the static electrophoresis experiment on the Apollo-Soyuz mission, the continuous flow apparatus used in the same mission and a miniaturized electrophoresis apparatus. B.J.

A76-31513 **Clinical correlates of coronary cineangiography in young males with myocardial infarction.** S. V. Savran, A. L. Bryson, T. G. Welch, B. L. Zaret, R. L. McGowan, and M. D. Flamm, Jr. (USAF, David Grant Medical Center, Travis AFB, Calif.). *American Heart Journal*, vol. 91, May 1976, p. 551-555. 16 refs.

A group of 38 men who incurred acute transmural myocardial infarction before age 40 and who after recovery were New York Heart Association functional Class I or II was studied by noninvasive

means and by coronary angiography in order to determine whether these noninvasive studies could predict the presence of significant coronary artery disease remote from that felt to be responsible for the previous myocardial infarction. The subjects were divided into two groups according to the absence or presence of obstructive disease in a major coronary artery supplying the myocardium remote from the prior myocardial infarction. Experimental results indicate that the absence of angina pectoris and the presence of a negative submaximal exercise test in young males who have a history of transmural myocardial infarction can be considered strong evidence against the presence of additional obstructive coronary artery disease and may obviate the need for coronary cineangiographic study. S.D.

A76-31525 * **The search for life in the solar system.** N. H. Horowitz (California Institute of Technology, Pasadena, Calif.). *Accounts of Chemical Research*, vol. 9, 1976, p. 1-7. 57 refs. Grant No. NGR-05-002-308.

The search for extraterrestrial life in the solar system is reviewed in the light of present knowledge about the physical state of the planets. Arguing that all life in the universe is based on carbon chemistry, the carbon abundance in the solar system is discussed along with the composition of the planets, the presence of organic compounds (particularly amino acids) in meteorites, and the existence of complex organic compounds in interstellar space. Prospects for life in the solar system are evaluated by eliminating most of the bodies as potential biological habitats on the basis of temperature and lack of an atmosphere. Bodies eliminated in this manner include the moon, most of the other satellites, Mercury, Venus, the asteroids, and the giant planets. It is shown that the outlook for life on Titan is uncertain, but that Mars fulfills the minimum conditions for a life-bearing planet. Theories on the Martian surface environment are reviewed, the problem of the lack of water on Mars is examined, and the possibility of climatic changes is considered. The Viking mission is briefly noted. F.G.M.

A76-31552 # **On the biomechanics of the vascular wall.** C. Hartung and O. Mahrenholtz (Hannover, Technische Universität, Hanover, West Germany). *(Gesellschaft für angewandte Mathematik und Mechanik, Wissenschaftliche Jahrestagung, Gottingen, West Germany, Apr. 1-5, 1975.) Zeitschrift für angewandte Mathematik und Mechanik*, vol. 56, Mar. 1976, p. T 110-T 112.

Vascular tissues exhibit a highly nonlinear load-deformation response which is dependent on three major wall components: elastin and collagen fibers and a nonfibrous matrix, termed ground-substance. A continuum-mechanical model based on thermodynamical considerations has been constructed and used to investigate the interaction and contribution of these vascular components. The mechanical strain work done by each component was determined as a function of the mean radii quotient of the vessel wall; the contribution of elastin and collagen to the vascomechanics was found to be significant at normal physiological pressures. The dependency of intravessel pressure on the vessel thickness and inner radius as determined using the model was in good agreement with experiment. C.K.D.

A76-31625 * **Nonprevalence of biochemical fossils in kerogen from pre-Phanerozoic sediments.** J. Leventhal, S. E. Suess, and P. Cloud (California, University, Santa Barbara, Calif.). *National Academy of Sciences, Proceedings*, vol. 72, Dec. 1975, p. 4706-4710. 44 refs. NSF Grant No. GB-23809; Grant No. NGR-05-010-035.

A76-31649 * **Sporulation and ultrastructure in a late Proterozoic cyanophyte - Some implications for taxonomy and plant phylogeny.** P. Cloud, M. Moorman, and D. Pierce (California, University, Santa Barbara, Calif.). *Quarterly Review of Biology*, vol. 50, June 1975, p. 131-150. 58 refs. Research supported by the National Academy of Sciences; NSF Grant No. GB-23809; Grant No. NGR-05-010-035.

Electron microscopical studies of a morphologically diverse, coccoid, presumably late Proterozoic blue-green alga are here reported. They show, together with light microscopy, that the form studied is widespread in the Cordilleran geosyncline, extend the record of well-defined endosporangia perhaps 700 million years into the past, and reveal previously unrecorded ultrastructural details. Coming from northeastern Utah, southwestern Alberta, and east central Alaska, these minute fossils belong to the recently described, morphologically diverse taxon Sphaerocongregus variabilis Moorman, are related to living entophysalidaceans, and have affinities with both the chroococcalean and chamaesiphonalean cyanophytes. Included in the morphological modes displayed by this alga are individual unicells, coenobial clusters of unicells, and a range of endosporangia comparable to those described for living entophysalidaceans. Scanning and transmission electron microscopy reveal that the endospores are commonly embedded in a vesicular matrix, that some of them show what appears to be a bilaminate or perhaps locally multilaminate wall structure, and that some remain together to mature as coenobial clones or 'colonies'. Taxonomic classification and phylogeny are discussed. (Author)

A76-31650 * **Effects of ingestion of a carbohydrate-fat meal on the levels and synthesis of 5-hydroxyindoles in various regions of the rat central nervous system.** J. L. Colmenares, R. J. Wurtman, and J. D. Fernstrom (MIT, Cambridge, Mass.). *Journal of Neurochemistry*, vol. 25, 1975, p. 825-829. 18 refs. Research supported by the John A. Hartford Foundation; Grants No. PHS-AM-14228; No. NGR-22-009-672.

A76-31721 **Visual adaptation - Retinal transduction, brightness and sensitivity.** R. J. W. Mansfield (Harvard University, Cambridge, Mass.). *Vision Research*, vol. 16, no. 7, 1976, p. 679-690. 67 refs. Research supported by the Medical Research Council of Canada and Harvard University; Grant No. PHS-NS-02974.

Two types of experiments were carried out to corroborate the hypothesis that light adaptation at scotopic and mesopic levels is produced by nonlinearities in the mechanisms of retinal transduction. To test this hypothesis, brightness measured by a method of magnitude estimation and increment thresholds obtained by a method of adjustment were determined for combinations of 5 deg test fields superimposed with a delay upon 5 deg adapting fields over a range of 6 log units of intensity in the scotopic and mesopic range. The increment in brightness produced by a given test intensity at different adapting levels varied in accord with equations describing brightness in a steady state. Except near absolute threshold, increment threshold increased as a power function of adapting level with an exponent of 2/3 in accord with a prediction based on a fixed threshold criterion of brightness. The evidence obtained can be used to suggest a theoretical basis for the Weber-Fechner relation. S.D.

A76-31722 **Stimulus alternation and the Purkinje shift.** M. Korth and J. C. Armington (Northeastern University, Boston, Mass.). *Vision Research*, vol. 16, no. 7, 1976, p. 703-711. 28 refs. Grant No. NIH-EY-0759.

Experiments were conducted to determine the simultaneous spectral sensitivity of the human ERG and VEP (visual evoked potential recorded from scalp electrodes) over an adaptation range extending from scotopic to photopic. Each subject was dark-adapted for 30 min prior to any recording, the VEP was obtained with an electrode over the inion with a reference to the right earlobe, and the ERG was obtained with an electrode held to the cornea with a contact lens with a reference to the right forehead. A major finding is that a Purkinje shift takes place over approximately the same adaptation range at the two recording sites. Mixed activity was the rule over most of the adaptation range, but the relative prominence of photopic activity increased with light adaptation. The data show that the B wave is scotopic at low stimulus levels. Spectral sensitivity of the B wave, the after potential and the VEP, although grossly similar, exhibit certain reliable differences which reflect changes in the processing of visual information and particularly the relative weighting of scotopic and photopic information. S.D.

A76-31723 **Brightness contrast in the Ehrenstein illusion.** L. Spillmann, K. Fuld (Neurologische Universitatsklinik, Freiburg im Breisgau, West Germany), and H. J. M. Gerrits (Nijmegen, Universiteit, Nijmegen, Netherlands). *Vision Research*, vol. 16, no. 7, 1976, p. 713-719. 36 refs. Deutsche Forschungsgemeinschaft Grant No. SFB-70.

The Ehrenstein illusion, displaying bright or dark patches surrounded by quasi-perceptive borders, was investigated psychophysically. Experiments showed that the illusion is present without eye movements. It is seen with dichoptic presentation of the inducing pattern and persists in scotopic vision, as well as at low contrast between figure and background. Illusory patches are perceived with stimulation of both the fovea and near-peripheral retina. The findings indicate a post-retinal origin of the contrast phenomenon and are discussed in terms of the cortical spreading activity proposed by Gerrits and Vendrik (1970) in their filling-in hypothesis. In appearance, the Ehrenstein illusion seems to be related to the Kanizsa triangle illusion and may share the same underlying mechanism. (Author)

A76-31724 **Luminance-duration relation in reaction time to spectral stimuli.** T. Ueno (Osaka City University, Osaka, Japan). *Vision Research*, vol. 16, no. 7, 1976, p. 721-725. 10 refs.

The luminance-duration relation was investigated by reaction time to blue and red stimuli of varying luminance and duration. The luminance required to produce ten criterion reaction times was calculated at each of eleven durations. For the two spectral stimuli, the slope of the function relating luminance to duration was less than that predicted by Bloch's law. However, the following was found: the blue stimulus shows small partial summation and has long critical duration, whereas the red stimulus presents large summation and has short critical duration. The results were discussed in terms of the receptive field hypothesis. (Author)

A76-31725 **Adaptation alters perceived direction of motion.** E. Levinson and R. Sekuler (Northwestern University, Evanston, Ill.). *Vision Research*, vol. 16, no. 7, 1976, p. 779-781. 11 refs. Grant No. NIH-EY-00321.

Experiments were carried out to define the neural code for the perceived direction of motion of a moving object, with particular reference to any shift in the perceived direction. The stimuli used were sheets of random dots generated on a cathode ray display under control of a small computer. Each experimental session began with 3 min continuous exposure to a pattern of adaptation dots, after which the adapting dots were replaced every 3 sec by a 1-sec presentation of test dots followed by a 1-sec presentation of a luminous line of adjustable orientation. The perceived direction shift as a function of the direction of adapting movement is schematically illustrated and discussed. A major conclusion is that perceived direction may depend on the response distribution among direction-selective neurons, and an adaptation-induced shift in perceived direction may be caused by alteration of this distribution. The perceived shift thus provides an initial insight into the neural code for perception of movement. S.D.

A76-31829 **Investigation of the cochlear and evoked potentials of guinea pigs subjected to the action of N-shaped waves simulating the sonic boom (Etude des potentiels cochléaires et des potentiels évoqueés auditifs en réponse à des ondes en N, simulant le bang sonique, chez le cobaye).** A. Dancer and R. Franke (Institut Franco-Allemand de Recherches, Saint-Louis, Haut-Rhin, France). *Acustica*, vol. 35, Apr. 1976, p. 55-62. 25 refs. In French.

The investigation of the cochlear and evoked potentials of guinea pigs subjected to the action of N-shaped waves simulating the sonic boom has shown that the response appears only at the impact of the fore and aft shock fronts. These observations are explainable taking into account both the transfer function of the middle ear and input impedance of the the cochlea of the guinea pig. The amplitude of the responses increases with the pressure rise time of both shock fronts. Within the range of practical use of the results achieved, it should be possible to obtain improved knowledge of the startle effect arising from the influence of the sonic boom as well as of its loudness. (Author)

A76-31923 **Thermal homeostasis in rats after intrahypothalamic injections of 6-hydroxydopamine.** J. G. Van Zoeren and E. M. Stricker (Pittsburgh, University, Pittsburgh, Pa.). *American Journal of Physiology*, vol. 230, Apr. 1976, p. 932-939. 48 refs. Grants No. NIH-MH-25140; No. NIH-MH-20620.

Experiments were conducted to study the thermoregulatory capabilities in the heat and cold of male albino rats subjected separately to biochemical lesions in order to destroy at least 90% of the norepinephrine-containing neurons in the preoptic/anterior hypothalamic region (PO/AH) by local injection of 6-hydroxydopamine and to electrolytic lesions of PO/AH by current-carrying implanted electrodes. Measurements were made of body temperature, tail temperature, evaporative water loss, and oxygen consumption. A major finding is that specific destruction of virtually all norepinephrine-containing nerve terminals in PO/AH did not disrupt thermoregulation by rats either in the heat or in the cold. Striking impairments are observed in rats after electrolytic lesions of PO/AH. There is evidence to suggest that rats can maintain thermal balance in the cold if lesions spare ventral portions of PO/AH. New doubts are raised about whether central noradrenergic fibers play an important part in the regulation of body temperature in rats. S.D.

A76-31924 **Effect of carotid sinus nerve stimulation pattern on cardiorespiratory responses.** M. N. Levy (Mount Sinai Hospital, Cleveland, Ohio) and H. Zieske (Case-Western-Reserve University, Cleveland, Ohio). *American Journal of Physiology*, vol. 230, Apr. 1976, p. 951-958. 29 refs. Grant No. PHS-HL-15758.

STAR ENTRIES

N76-22872 Utah Univ., Salt Lake City.
THE TRANSIENT RESPONSE OF ENCAPSULATED ENZYMES Ph.D. Thesis
Edward Michael Trujillo 1975 345 p
Avail: Univ. Microfilms Order No. 76-8659

A mathematical model for the transient response of encapsulated enzymes was developed that delineates the effects of the outer boundary layer, the encapsulating membrane, the partition coefficient, and diffusion with reaction within the encapsulating medium. The model incorporates both first order kinetics and Michaelis-Menten kinetics for the reaction rate. Using typical microcapsule parameters it was found that (1) the partition coefficient affects the overall rate only when the rate limiting step is diffusion through the membrane, (2) the transient overall effectiveness factor rises sharply with time and approaches an asymptotic value for most situations, and (3) the first order approximation to Michaelis-Menten kinetics is not valid when the initial bulk concentration is higher than the Michaelis constant and the overall rate is reaction limited. For extremely high enzyme loadings, the steady-state hypothesis can no longer be applied, but the reaction rate can be shown to be first order in substrate concentration.
Dissert. Abstr.

N76-22873*# Southwest Research Inst., San Antonio, Tex.
BIOMEDICAL APPLICATIONS ENGINEERING TASKS Final Report
Charles J. Laenger 2 Apr. 1976 7 p
(Contract NAS9-14321; SwRI Proj. 14321)
(NASA-CR-147584) Avail: NTIS HC $3.50 CSCL 06B

The engineering tasks performed in response to needs articulated by clinicians are described. Initial contacts were made with these clinician-technology requestors by the Southwest Research Institute NASA Biomedical Applications Team. The basic purpose of the program was to effectively transfer aerospace technology into functional hardware to solve real biomedical problems.
Author

N76-22874*# Scientific Translation Service, Santa Barbara, Calif.
STERILIZATION TESTS WITH ETHYLENE OXIDE
Berger, B. Schmidt, and H. Dobberstein Washington NASA May 1976 46 p refs Transl. into ENGLISH from Zentr. Bacteriol., Parasitenk., Abt. 1. Orig. (West Germany), v. 185, 1962 p 526-553
(Contract NASw-2791)
(NASA-TT-F-17007) Avail: NTIS HC $4.00 CSCL 06M

The germicide effect of ethylene oxide was tested in the Den Venue sterilizer and in the Sterivit device on vegetative forms, sporogenators, fungi and earth spores. Small cambric cloth pieces and dental instruments were used as germ carriers. Ethylene oxide concentrations of 1000-12000 mg/l were used. Periods of 15 minutes up to 19 hours were chosen. Temperature was between 24 and 55 C. Relative moisture in the Sterivit device fluctuated between 55 and 60%. The experiments demonstrate that ethylene oxide has a certain germicide action, but that the certainty of the success is much smaller than that of the previously used methods: hot air and steam pressure.
Author

N76-22875*# Scientific Translation Service, Santa Barbara, Calif.
TESTING OF STEAM AND GAS STERILIZERS
Kurt Liebermeister Washington NASA May 1976 35 p refs Transl. into ENGLISH from Zentr. Bacteriol., Parasitenk., Abt. 1 Orig. (West Germany), v. 184, 1962 p 181-201
(Contract NASw-2791)
(NASA-TT-F-17005) Avail: NTIS HC $4.00 CSCL 06M

It is recommended that thermoelectric testing of steam sterilizers be done using an electronic null balance amplifier and a 6 color recorder, as well as a test container with a standardized material to be sterilized. Various materials show an antibacterial aftereffect on treatment with ethylene oxide. Cultural testing of samples for bacterial growth should be done to rule out any aftereffect of the ethylene oxide on growth of test organisms.
Author

N76-22876*# Lockheed Electronics Co., Houston, Tex.
SYSTEM DEVELOPMENT OF THE SCREWWORM ERADICATION DATA SYSTEM (SEDS) ALGORITHM
G. Arp, F. Forsberg, L. Giddings, and D. Phinney Jan. 1976 85 p refs
(Contract NAS9-12200)
(NASA-CR-147552; LEC-7646; JSC-10965) Avail: NTIS HC $5.00 CSCL 06C

The use of remotely sensed data is reported in the eradication of the screwworm and in the study of the role of the weather in the activity and development of the screwworm fly. As a result, the Screwworm Eradication Data System (SEDS) algorithm was developed.
Author

N76-22877*# Baylor Univ., Houston, Tex. Dept. of Microbiology and Immunology.
EARLY DETECTION OF DISEASE PROGRAM: EVALUATION OF THE CELLULAR IMMUNE RESPONSE Final Report, Aug. 1972 - Aug. 1974
B. S. Criswell, Vernon Knight, R. R. Martin, and J. A. Kasel Aug. 1974 194 p
(Contract NAS9-13139)
(NASA-CR-147594) Avail: NTIS HC $7.50 CSCL 06M

The early cellular responses of specific components of the leukocyte and epithelial cell populations to foreign challenges of both an infectious and noninfectious character were evaluated. Procedures for screening potential flight crews were developed, documented, and tested on a control population. Methods for preparing suitable populations of lymphocytes, polymorphonuclear leukocytes, macrophages, and epithelial cells were first established and evaluated. Epithelial cells from viral infected individuals were screened with a number of anti-viral antisera. This procedure showed the earliest indication of disease as well as providing a specific diagnosis to the physicians. Both macrophages and polymorphonuclear leukocytes were studied from normal individuals, smokers, and patients with viral infections. Newer techniques enabling better definition of lymphocyte subpopulations were then developed, namely the E and EAC rosette procedures for recognition of T (thymus-derived) and B (bone-marrow-derived) lymphocyte subpopulations. Lymphocyte and lymphocyte subpopulation response to multiple mitogens have been evaluated.
Author

N76-22878*# Baylor Univ., Houston, Tex. Dept. of Microbiology and Immunology.
EARLY DETECTION OF DISEASE PROGRAM: EVALUATION OF THE CELLULAR IMMUNE RESPONSE Final Report, Aug. 1974 - Aug. 1975
B. S. Criswell, Vernon Knight, R. R. Martin, and J. A. Kasel Jan. 1975 25 p refs
(Contract NAS9-13139)
(NASA-CR-147595) Avail: NTIS HC $3.50 CSCL 06M

Surfaces of normal, cultured, and mitogen-stimulated mouse lymphoid cells were examined by scanning electron microscopy (SEM). Lymphocytes with smooth, highly villous and intermediate surfaces were observed in cell suspensions from both spleens and thymuses of normal mice and from spleens of congenitally athymic (nude) mice. Several strain-specific surface features were noted, including the spine-like appearance of microvilli on

C57B1/6 lymphocytes. Although thymus cell suspensions contained somewhat more smooth cells than did spleen cell preparations, lymphocyte derivation could not be inferred from SEM examination. Studies of cells stimulated with mitogenic agents for thymus-derived lymphocytes (concanavalin A) or for bone marrow-derived lymphocytes (lipopolysaccharide) suggested that, in the mouse, development of a complex villous surface is a general concomitant of lymphocyte activation and transformation. Author

N76-22879*# Clemson Univ., S.C. College of Physical, Mathematical, and Biological Sciences.
[INCREASED CONCENTRATION OF PSEUDOMONAS AERUGINOSA AND STAPHYLOCOCCUS SP. IN SMALL ANIMALS EXPOSED TO AEROSPACE ENVIRONMENTS]
Final Report, 1 Jul. 1971 - 31 Dec. 1972
Rufus K. Guthrie 12 May 1976 28 p
(Contract NAS9-10494)
(NASA-CR-147570) Avail: NTIS HC $4.00 CSCL 06C

The effects of increased concentrations of PSEUDOMONAS AERUGINOSA AND STAPHYLOCOCCUS in the total bacterial flora of small animals exposed to simulated spacecraft environments were evaluated. Tests to detect changes in infectivity, effects of antibiotic treatments, immune responses to bacterial antigens, and effectiveness of immune responses in the experimental environment were conducted. The most significant results appear to be the differences in immune responses at simulated altitudes and the production of infection in the presence of a specific antibody. Author

N76-22880# Los Alamos Scientific Lab., N.Mex.
SURVIVAL OF CULTURED MAMMALIAN CELLS IRRADIATED AT VARIOUS DEPTHS IN THE LAMPF NEGATIVE PION THERAPY BEAM
P. W. Todd, J. Dicello, G. West, C. Shonk, M. M. Kligerman, and M. R. Raju Aug. 1975 4 p refs
(Contract W-7405-eng-36)
(LA-6049-MS) Avail: NTIS HC $4.00

Cultured human kidney T-1 cells were irradiated in flasks or on coverslips at different depths in a water phantom using the Clinton P. Anderson Meson Physics Facility (LAMPF) negative pion beam. Studies of cell survival and division delay as a function of depth and recovery between doses indicate RBEs of 1.8 + 0.3 and an ability of cells to recover between two doses of stopping pions. Author (NSA)

N76-22881# Interuniversitair Reactor Instituut, Delft (Netherlands).
COPPER-METABOLISM, PARTICULARLY IN RELATION TO WILSON'S AND MENKES' DISEASES
C. J. A. vandenHamer, J. Willemse (Univ. Hosp., Utrecht), and G. deHaas (Univ. Hosp., Utrecht) 1975 21 p refs Presented at the Symp. on Nuclear Medicine, Utrecht, 24-25 Oct. 1975
(IRI-133-75-12) Avail: NTIS HC $3.50

Although the amount of Cu in the body is usually well regulated, special circumstances may lead to Cu-toxicity or Cu-deficiency. Moreover, two hereditary defects are known: in Wilson's disease Cu is insufficiently excreted; in Menkes' disease alimentary Cu is insufficiently resorbed. Results obtained with the Cu-64 loading test, which can differentiate between normal controls and patients with Wilson's and Menkes' diseases, are described. Author (ESA)

N76-22882# Kansas State Univ., Manhattan. Dept. of Industrial Engineering.
SUBCUTANEOUS TEMPERATURES AND PHYSICAL RESPONSES OF SHEEP TORSO COOLED WITH DRY ICE
J. Duncan, S. Konz, and D. Ames Oct. 1975 42 p refs
(Grants NSF ENG-73-03676)
(PB-247366/8; Contrib-504) Avail: NTIS HC $4.00 CSCL 06S

General hypothermia and local cooling of specific exposed organs have been reported on electrocardiagram responses, renal function, blood chemistry, and metabolism, respiration and circulation. Extrapolation from general hypothermia to locally cooling the torso with dry ice pockets may not be valid. Therefore the authors measured changes in subcutaneous temperature and heat flow rate at the skin surface, recorded electrocardiograms of sheep wearing a dry ice cooling garment in a hot environment and compared the changes with those observed in a general cold stress environment and those in a heat stress environment without a cooling garment. GRA

N76-22883# National Inst. for Community Development, Inc., Washington, D.C.
HEALTH SERVICE TECHNOLOGY BIBLIOGRAPHIC SERVICE. VOLUME 4: AN ASSESSMENT OF POTENTIAL IMPACT OF THE MINIATURE CENTRIFUGAL FAST ANALYZER UPON THE LABORATORY SERVICES FIELD
Final Report, 22 Jun. 1974 - 20 Jul. 1975
Diana Stark Oresky 7 Oct. 1975 96 p
(Contract PHS-HRA-106-74-21)
(PB-247748/7; NCHSR-76/47-Vol-4) Avail: NTIS HC $5.00
HC also available from NTIS $16.00/set of 4 reports as PB-247744-SET CSCL 06L

An assessment was made of the impact to the current situation of laboratory test provisions that would be caused by the advent of a miniaturized centrifugal fast analyzer, a spectrophotometer unique in its biochemical test capabilities as related to its size and its use of microvolume samples. The device is examined in relation to commercially available analytical instruments, biochemical test needs of health care providers, and current capability for meeting those needs. GRA

N76-22884 Maryland Univ., College Park.
THE REGENERATIVE RESPONSE OF THE SYMPATHETIC NERVOUS SYSTEM TO HYPOBARIC HYPOXIA Ph.D. Thesis
Robert Donald Resau 1975 74 p
Avail: Univ. Microfilms Order No. 76-8431

Biochemical estimations were made of the effects of hypobaric hypoxia on 6-hydroxydopamine-induced degeneration and subsequent regeneration of cardiac sympathetic nerve terminals and of changes in sympathoadrenal catecholamines as a result of hypoxia activation. Regeneration was assessed through estimations of the reestablishment of catecholamine stores and axonal uptake of tritiated norepinephrine. Catecholamine levels in cardiac sympathetic nerves were reduced by 75-80% by 6-hydroxydopamine and hypoxia did not accentuate or lessen the depletion. Recovery of cardiac norepinephrine and amine uptake capacity was seen three weeks after sympathectomy and was unaffected by hypoxic stress. Restoration of amine uptake capacity was more rapid than that of endogenous norepinephrine stores in cardiac tissue three weeks after sympathectomy, indicating that the uptake ability of regenerating axonal membranes was being restored at a faster rate than recovery of endogenous stores of the transmitter. Dissert. Abstr.

N76-22885*# Scientific Translation Service, Santa Barbara, Calif.
STUDY OF CIRCADIAN VARIATION OF DIFFERENT CIRCULATORY AND RESPIRATORY FUNCTIONS AT SUBMAXIMAL AND MAXIMAL ERGOMETER WORK
J. Ilmarinen, J. Rutenfranz, H. Kylian, and E. Klimt Washington NASA Apr. 1976 22 p refs Transl. into ENGLISH from Eur. J. of Appl. Physiol. (West Germany), v. 34, no. 4, 1975 p 255-267
(Contract NASw-2483)
(NASA-TT-F-16997) Avail: NTIS HC $3.50 CSCL 06S

The maximal aerobic power of six highly trained young cyclists was directly measured at intervals of 4 hrs. A Latin square design was used for the test order. The results suggest a decrease in cardiopulmonary working capacity at night. However, this impairment is only of practical importance if the work will be done near the limit of endurance capacity. Besides it will suggest that the indirect methods for assessing the cardiopulmonary capacity based on V sub 0 2 max and W170 are not useful at nighttime, because the presuppositions for these methods are limited to the time of day. Author

N76-22886*# Kanner (Leo) Associates, Redwood City, Calif.
MASSIVE TRANSFUSIONS AND THERMOREGULATION

Constantin Washington NASA Apr. 1976 18 p refs
ansl. into ENGLISH from Anesthesie Analgesie, Reanimation
Masson), v. 32, no. 6, 1975 p 961-970
ontract NASw-2790)
ASA-TT-F-17008) Avail: NTIS HC $3.50 CSCL 06P

The importance of the direct mechanism of deep body cooling s opposed to the usual modes of action of cutaneous cooling) emphasized, and the effects of cold on metabolism, circulatory henomena and hematologic disturbances are analyzed separately. he rectal-esophageal temperature difference takes on its full athologic significance upon arousal from anesthesia. Warming f the blood and the use of adrenolytic agents seem to be ecessary to protect the body when massive transfusions are dministered. Author

76-22887*# Tennessee Univ., Memphis.
OXICITY OF THE PYROLYSIS PRODUCTS OF SPACE-RAFT MATERIALS Annual Report, 1 Aug. 1974 - 31 Jan. 976
V. H. Lawrence 29 Mar. 1976 79 p
Contract NAS9-13617)
NASA-CR-147563; AR-2) Avail: NTIS HC $5.00 CSCL 96T

Data is presented which provides guides to (1) approximate emperature necessary to initiate thermodegradation of the olymeric materials tested, (2) the relative toxicity of thermodegra-lation products from the various materials, (3) the relative mportance of carbon monoxide as the primary cause of death as contrasted to cyanide or other toxic gases), and (4) whether r not the hazards of the fumes are confined to the time of xposure, or whether post-exposure death is likely. Two different xperimental methods were employed. Author

N76-22888*# Methodist Hospital, Houston, Tex.
AUTOMATED ELECTROENCEPHALOGRAPHY SYSTEM AND ELECTROENCEPHALOGRAPHIC COORDINATES OF SPACE MOTION SICKNESS, PART 1 Final Report
James D. Frost, Jr. 25 Mar. 1976 35 p ref
Contract NAS9-13870)
NASA-CR-147554) Avail: NTIS HC $4.00 CSCL 06E

A self-contained and portable device which permits clinical lectroencephalography (EEG) to be conducted in remote locations y minimally trained, nontechnical personnel was developed and ested. The unit accomplishes semiautomatic acquisition of EEG lata from the patient, simultaneous transmission of eight data hannels to a central hospital facility over conventional telephone quipment, and automatic printing (at the remote site) of the EEG report generated at the central location. Consequently, his system enables the delivery of high-quality EEG diagnostic ervices in a geographically remote site with the accuracy and peed formerly possible only in certain large medical centers. Beside obvious potential clinical applications, this system serves as an initial prototype of a unit which could provide inflight EEG during future space missions. Author

N76-22889*# Harding Coll., Searcy, Ark.
PROGRAM TO STUDY OPTIMAL PROTOCOL FOR CARDIOVASCULAR AND MUSCULAR EFFICIENCY Progress Report, 1 Jul. - 31 Dec. 1975
Harry D. Olree 31 Dec. 1975 22 p refs
(Contract NAS9-14134-1S)
(NASA-CR-147556) Avail: NTIS HC $3.50 CSCL 06P

Two possible ways to minimize the effects of deconditioning in space are: To achieve a very high level of conditioning immediately prior to flight, and to provide a regimen in the capsule which will maintain a moderate degree of fitness. It was determined that running and riding a bicycle ergometer at comparable heart rates produced similar gains in physical fitness variables. It was found that subjects who exercised at a 180 heart rate made greater gains in physical fitness than did those exercising at a 140 or 160 heart rate. When the length of the workout was varied, subjects exercising sixty minutes per day made greater gains than those exercising twenty or forty minutes per day. Subjects who discontinued training slowly deconditioned, but a moderate level of fitness could be maintained by exercising at a pulse rate of 160 beats per minute for twenty minute periods three times a week. Subjects who overtrained twice daily to near exhaustion increased in fitness. Author

N76-22890*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A CERVIX-TO-RECTUM MEASURING DEVICE IN A RADIATION APPLICATOR FOR USE IN THE TREATMENT OF CERVICAL CANCER Patent Application
David R. Fischell (Howard Univ.) and Jeffrey Mazique, inventors (to NASA) (Howard Univ.) Filed 31 Mar. 1976 12 p
(Grant NGT-09-011-051)
(NASA-Case-GSC-12081-1; US-Patent-Appl-SN-672209) Avail: NTIS HC $3.50 CSCL 06B

A cervix-to-rectum measuring device to be used in the treatment of cervical cancer is presented. It includes a handle and a probe pivotably connected to the handle for insertion in the rectum. The measuring device further includes means for coupling the handle to an intrauterine radiation applicator when the latter is positioned in the uterine cervix and the probe is inserted in the rectum to pivot the handle about the probe. A gear is provided which is adapted to pivot with the probe. A pinion pivotably connected to the handle meshes with the gear. A pointer fixed to the pinion is displaced in response to the pivoting of the handle about the probe, and this displacement can be read from a scale on the handle, providing an indication of the cervix-to-rectum distance. NASA

N76-22891*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CORNEAL SEAL DEVICE Patent Application
E. F. Baehr, inventor (to NASA) Filed 13 Apr. 1976 16 p
(NASA-Case-LEW-12258-1; US-Patent-Appl-SN-676433) Avail: NTIS HC $3.50 CSCL 06B

A corneal seal device is provided which, when placed in an incision in the eye, permits the insertion of a surgical tool or instrument through the device into the eye. The device includes a seal chamber which opens into a tube which is adapted to be sutured to the eye and serves as an entry passage for a tool. A sealable aperture in the chamber permits passage of the tool through the chamber into the tube and hence into the eye. The chamber includes inlet ports adapted to be connected to a regulated source of irrigation fluid which provides a safe interocular pressure. NASA

N76-22892*# Texas Univ., Houston. School of Public Health.
PUBLIC HEALTH APPLICATIONS OF REMOTE SENSING OF VECTOR BORNE AND PARASITIC DISEASES Final Report
[1976] 204 p
(Contract NAS9-12696)
(NASA-CR-147573) Avail: NTIS HC $7.75 CSCL 06F

Results of an investigation of the potential application of remote sensing to various fields of public health are presented. Specific topics discussed include: detection of snail habitats in connection with the epidemiology of schistosomiasis; the detection of certain Anopheles breeding sites, and location of transient human populations, both in connection with malaria eradication programs; and detection of overwintering population sites for the primary screwworm (Cochliomyia americana). Emphasis was placed on the determination of ground truth data on the biological, chemical, and physical characteristics of ground waters which would or would not support the growth of significant populations of mosquitoes. J.M.S.

N76-22893*# Telecare, Inc., Houston, Tex. System Safety Branch.
PORTABLE MEDICAL STATUS SYSTEM
Otho C. Lindsey Feb. 1976 30 p refs
(Contract NAS9-14334)
(NASA-CR-147558; JSC-10753) Avail: NTIS HC $4.00 CSCL 06B

The hazards inherent in the Portable Medical Status System are identified, and the measures taken to reduce them to an acceptable level are described. Identification of these hazards is a prerequisite to use of the system on humans in the earth environment. One hazard which is insufficiently controlled and which is considered a constraint to use on humans is the level

of current possible in the electrodes for the EEG (electroencephalograph) circuitry. It exceeds the maximum specified. A number of procedural and design recommendations for enhancement of safety are made. Author

N76-22894*# Albany Medical Coll., N.Y. Inst. of Comparative and Human Toxicology.
STUDY OF TOXICOLOGICAL EVALUATION OF FIRE SUPPRESSANTS AND EXTINGUISHERS Final Report
31 Mar. 1975 209 p refs
(Contract NAS9-9964)
(NASA-CR-147658) Avail: NTIS HC $7.75 CSCL 06T

The application of fluorocarbons as possible candidates for fire extinguishers and/or suppressants in confined spaces (such as spacecraft, aircraft, or submarines) was investigated, with special emphasis on their safety to man since they would be inhaled on an almost continuous basis. Short-term exposure experiments, using various animal species, were devised to look at specific parameters in order to determine which of the candidate compounds were sufficiently non-toxic to warrant long-term investigations. The following physiologic criteria were examined: tissue distribution, fluoride concentration, effect on mitochondria, microsomes, liposomes, and liver cell nuclei, erythrocyte fragility, clinical chemistry values, hematology, pathology, cardiac sensitization, behavioral effects. Various rodent species were used for initial investigations, with non-human primate exposures for Freon 116 which was warranted for negative results on rodents. Various types of exposure chambers were used, including closed dynamic chambers allowing for a recirculating atmosphere. Y.J.A.

N76-22895# Australian Atomic Energy Commission, Coogee.
HEALTH AND SAFETY RECORD OF THE NUCLEAR INDUSTRY
M. W. Carter, E. Carruthers, and J. C. E. Button Sep. 1975 24 p refs
(AAEC/IP-8) Avail: ERDA Depository Libraries HC $4.25

The claim of the nuclear industry to have an excellent safety record is examined in terms of health and accident records of workers in the industry. The nuclear industry is considered to include all work with ionizing radiations and radioactive materials, in education, research, medicine and industry. Comparisons are made with the published records of other industries, and a study is made of the performance of the nuclear industry in relation to its own safety criteria. Data are presented on the radiation exposure of nuclear workers in Europe, America, India and Australia, in relation to the internationally recommended limits, and there is some discussion of the risks involved in these limits. Author (NSA)

N76-22896# Oak Ridge National Lab., Tenn.
MEASUREMENT OF MAN'S EXPOSURE TO EXTERNAL RADIATION
K. Becker 1975 25 p refs Presented at the 2d Latin-Am. Conf. on Med. Phys. and Radiation Protect., Belo Horizonte, Brazil
(CONF-750738-1) Avail: NTIS HC $4.25

After outlining briefly the rationale for personnel radiation monitoring with integrating detectors, a review is presented of some developments which have taken place in personnel and environmental dosimetry during the past 3.5 years. The results of a pilot field experiment concerning the stability of film and thermoluminescent dosimeters (TLDs) in four Latin-American countries are summarized. It shows that film dosimeters should be used only with caution, and in locations with a moderate climate. A survey is being conducted on the current status and trends in personnel monitoring, involving detailed questioning of over 150 laboratories in about forty countries to obtain information on the type of service and detectors, evaluation and recordkeeping, additional applications, problem and development areas, intercomparisons, practical experiences with different systems, administrative and legal aspects, etc. Author (NSA)

N76-22897# Interuniversitair Reactor Instituut, Delft (Netherlands).
APPLICATIONS OF X-RAY FLUORESCENCE ANALYSIS IN MEDICINE
M. deBruin and P. J. M. Korthoven 1975 18 p refs Presented at the Symp. Nucl. Geneeskunde, Utrecht, 24-25 Oct. 1975
(IRI-133-75-08) Avail: NTIS HC $3.50

Present and future applications are discussed. These applications are detailed: in vivo analysis of organs or parts of organs, in vivo analysis of, for instance, blood, urine, and biopsy samples, and determination of element distributions at cellular level (micromapping). ESA

N76-22898# IIT Research Inst., Chicago, Ill.
BIOLOGICAL EFFECTS OF HIGH VOLTAGE ELECTRIC FIELDS: STATE-OF-THE-ART REVIEW AND PROGRAM PLAN Final Report
J. E. Bridges Nov. 1975 206 p refs
(IITRI Proj. E8151)
(PB-247454/2; EPRI-381-1-FR) Avail: NTIS HC $7.75 CSCL 06R

Although the great bulk of evidence suggests that there are no significant biological effects of electric fields as encountered under extra high voltage lines, further research is needed. Such research will be difficult and must be carefully done because the need is to uncovery any subtle effects, to prove a negative hypothesis, and to assure that transmission technology does indeed protect the public welfare. Priorities are identified and set for needed research in this area. The research plan identifies 23 specific projects which are presented in detail. GRA

N76-22899# IIT Research Inst., Chicago, Ill.
BIOLOGICAL EFFECTS OF HIGH VOLTAGE ELECTRIC FIELDS: BIBLIOGRAPHY AND SURVEY OF ONGOING WORK, 1975 Final Report
J. E. Bridges Nov. 1975 321 p refs
(PB-247455/9; EPRI-381-1B) Avail: NTIS HC $9.75 CSCL 06R

A bibliography and survey are presented of ongoing work concerning the biological effects of fields from power lines. Approximately 800 citations are noted, some with abstracts, and about 80 ongoing research efforts are identified. The following areas are emphasized: (1) ac power-line fields biological effects between 45-75 Hertz, (2) dc electrostatic field biological effects, and (3) ac power-line fields and radio-frequency wave influences on patients with implanted cardiac pacemakers. This material is intended to assist biologists and engineers concerning the biological effects of fields from overhead high-voltage power transmission lines and to guide in the planning and conduct of biological research. GRA

N76-22900# Michigan Univ., Ann Arbor. Highway Safety Research Inst.
BIOENGINEERING STUDY OF BASIC PHYSICAL MEASUREMENTS RELATED TO SUSCEPTIBILITY TO CERVICAL HYPEREXTENSION-HYPERFLEXION INJURY Final Report, 15 Jan. 1972 - 15 Sep. 1973
Richard G. Synder, Don B. Chaffin, and David R. Foust Sep. 1975 323 p
(PB-247763/6; UM-HSRI-BI-75-6) Avail: NTIS HC $9.75 CSCL 06S

Basic physical characteristics of the neck which may influence a person's susceptibility to whiplash injury during rear end collisions have been defined using 180 human volunteer subjects chosen, on the basis of sex, age, and stature, to be representative of the U.S. adult population. The results were used to develop a method of predicting dynamic muscle force from isometric EMG data, and to examine injury susceptibility for various population groups using a biomechanical model. GRA

N76-22901# Hawaii Univ., Honolulu.
STUDIES ON HUMAN PERFORMANCE IN THE SEA, VOLUME 1 Sea Grant Program
Sep. 1975 350 p refs
(Grants NOAA-2-35243; NSF GH-29; NSF GH-62; NSF GH-93)
(PB-247920/2; UNIHI-SeaGrant-MR-76-01; NOAA-75111704) Avail: NTIS HC $10.00 CSCL 06S

The compilation of papers examines physiologic responses to hyperbarism which range from basic to highly applied research - and tries to answer 'what are the limits, and why.' Sections of the report deal with: (1) Physiology of water immersion and breath holding; (2) thermoregulation and exercise in water and/or hyperbaric environment; (3) bubble formation during decompression; (4) hyperbaric pharmacology and effects of helium breathing; and (5) psychosensory function. GRA

N76-22902# Bureau of Radiological Health, Rockville, Md.
A COMPARISON OF INSTRUMENT PERFORMANCE IN MEASURING X-RAY TUBE CURRENT AND mAs
C. J. Daniels and J. L. Silberberg Aug. 1975 40 p refs
(PB-246751/2; DHEW(FDA)-76-8013) Avail: NTIS HC $4.00 CSCL 06L

The Bureau of Radiological Health evaluated two commercially available, noninvasive, large-aperture current probe systems for suitability in the measurement of X-ray tube current and X-ray tube current-time product as required in the enforcement of the Federal performance standard for diagnostic X-ray equipment. The response of the two systems to typical X-ray tube current waveforms is investigated and compared to the response necessary for good accuracy over the range of expected exposure times and tube currents. GRA

N76-22903# Mitre Corp., McLean, Va.
BENEFITS AND PROBLEMS OF SEVEN EXPLORATORY TELEMEDICINE PROJECTS Interim Report, 29 Jun. 1974 - 30 Apr. 1975
John J. ONeill, Joseph T. Nocerino, and Philip Walcoff Oct. 1975 101 p refs
(Contract HRA-106-74-182)
(PB-247840/2; MTR-6787; NCHSR-76/20) Avail: NTIS HC $5.50 CSCL 06E

Benefits and problems are considered for utilizing visual communications in the provision of health care as derived from the experiences of seven telemedicine projects sponsored by the National Center for Health Services Research from 1972 - 1974. Each of the projects covered by the report has a specific chapter. Each project chapter has an identical format which includes a summary of each project, a technological description, discussion of the training and orientation programs, and a delineation of operating and organizational procedures. GRA

N76-22904*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A MODEL FOR PREDICTION OF RIDE QUALITY IN A MULTIFACTOR ENVIRONMENT
Jack D. Leatherwood and Thomas K. Dempsey Apr. 1976 38 p refs Presented at 91st Meeting Acoustical Soc. of Am., Washington, D. C., 5-9 Apr. 1976
(NASA-TM-X-72842) Avail: NTIS HC $4.00 CSCL 05E

Recently a ride quality comfort model has been proposed which accounts for the effect of both multifrequency and multiaxes vibratory inputs, as well as nonvibratory inputs such as noise, on human comfort response. The proposed NASA ride quality model is described in general terms and selected results of several experimental investigations are presented that have contributed to the development of the model and to a more comprehensive understanding of human comfort response to vibration. Human subjective response to vertical vibration, combined vertical-lateral vibrations, and roll vibrations are discussed, and a set of vertical ride comfort curves is presented. Author

N76-22905*# Agnew Tech-Tran, Inc., Woodland Hills, Calif.
THE PROBLEM OF CREW INTERRELATIONSHIPS IN INTERNATIONAL SPACE FLIGHTS
A. A. Leonov Washington NASA Apr. 1976 30 p refs Transl. into ENGLISH from Vop. Filosofii. (USSR), no. 1, 1976 p 66-69
(Contract NASw-2789)
(NASA-TT-F-17001) Avail: NTIS HC $4.00 CSCL 05E

The problem of forming international spacecrews is considered. The essential purpose of uniting the crews by a common goal, mutual trust, and friendship is discussed. Overcoming the language barrier and ideological differences are obstacles mentioned in relation to the problem of crew selection. Some observations about the Apollo-Soyuz Test Project mission are given. Author

N76-22906# Life Sciences, Inc., Hurst, Tex.
TRAINING RESEARCH PROGRAM AND PLANS: ADVANCED SIMULATION IN UNDERGRADUATE PILOT TRAINING Final Report, Jun. 1973 - Jun. 1974
W. G. Matheny Jun. 1975 103 p refs
(Contract F41609-73-C-0038; AF Proj. 1123)
(AD-A016486; AFHRL-TR-75-26-2) Avail: NTIS CSCL 05/9

In this study, a survey was made among experts in pilot training to determine the important training research problems to be undertaken in order to increase training effectiveness in beginning pilot training. The highest priority problems were examined in the light of the research equipment capabilities of the Air Force Human Resources Laboratory, Flying Training Division and administrative constraints. The initial experiments in the area of training methodology and training simulator requirements are recommended and outlined. The performance equivalence approach to research in these areas is described. Studies are suggested designed to evaluate the concept and its use in training research. GRA

N76-22907*# Life Systems, Inc., Cleveland, Ohio.
INTEGRATION OF THE ELECTROCHEMICAL DEPOLORIZED CO2 CONCENTRATOR WITH THE BOSCH CO2 REDUCTION SUBSYSTEM Final Report
F. H. Schubert, R. A. Wynveen, and T. M. Hallick Mar. 1976 96 p refs
(Contract NAS8-30891)
(NASA-CR-144248; LSI-ER-237-10) Avail: NTIS HC $5.00 CSCL 06K

Regenerative processes for the revitalization of spacecraft atmospheres require an Oxygen Reclamation System (ORS) for the collection of carbon dioxide and water vapor and the recovery of oxygen from these metabolic products. Three life support subsystems uniquely qualified to form such an ORS are an Electrochemical CO2 Depolarized Concentrator (EDC), a CO2 Reduction Subsystem (BRS) and a Water Electrolysis Subsystem (WES). A program to develop and test the interface hardware and control concepts necessary for integrated operation of a four man capacity EDC with a four man capacity BRS was successfully completed. The control concept implemented proved successful in operating the EDC with the BRS for both constant CO2 loading as well as variable CO2 loading, based on a repetitive mission profile of the Space Station Prototype (SSP). Author

N76-22908*# Missouri Univ., Columbia. Dept. of Chemical Engineering.
MATHEMATICAL MODEL OF ONE-MAN AIR REVITALIZATION SYSTEM Final Report
Mar. 1976 208 p refs
(Contract NAS9-12526)
(NASA-CR-147580) Avail: NTIS HC $7.75 CSCL 06K

A mathematical model was developed for simulating the steady state performance in electrochemical CO2 concentrators which utilize (NMe4)2 CO3 (aq.) electrolyte. This electrolyte, which accommodates a wide range of air relative humidity, is most suitable for one-man air revitalization systems. The model is based on the solution of coupled nonlinear ordinary differential equations derived from mass transport and rate equations for the processes which take place in the cell. The boundary conditions are obtained by solving the mass and energy transport equations. A shooting method is used to solve the differential equations. Author

N76-22909*# DeBell and Richarson, Inc., Enfield, Conn.
WASH WATER WASTE PRETREATMENT SYSTEM STUDY Final Report, Mar. 1975 - Mar. 1976
Mar. 1976 59 p
(Contract NAS9-14518)
(NASA-CR-147588) Avail: NTIS HC $4.50 CSCL 06K

The use of real wash water had no adverse effect on soap

removal when an Olive Leaf soap based system was used; 96 percent of the soap was removed using ferric chloride. Numerous chemical agents were evaluated as antifoams for synthetic wash water. Wash water surfactants used included Olive Leaf Soap, Ivory Soap, Neutrogena and Neutrogena Rain Bath Gel, Alipal CO-436, Aerosol 18, Miranol JEM, Palmeto, and Aerosol MA-80. For each type of soapy wash water evaluated, at least one antifoam capable of causing nonpersistent foam was identified. In general, the silicones and the heavy metal ions (i.e., ferric, aluminum, etc.) were the most effective antifoams. Required dosage was in the range of 50 to 200 ppm. Author

N76-22910*# General Dynamics/Convair, San Diego, Calif.
BOSCH CO2 REDUCTION SYSTEM DEVELOPMENT Final Report
R. F. Holmes, C. D. King, and E. E. Keller Apr. 1976 37 p refs
(Contract NAS8-27276)
(NASA-CR-144282; CASD-NAS-76-020) Avail: NTIS HC $4.00 CSCL 06K

Development of a Bosch process CO2 reduction unit was continued, and, by means of hardware modifications, the performance was substantially improved. Benefits of the hardware upgrading were demonstrated by extensive unit operation and data acquisition in the laboratory. This work was accomplished on a cold seal configuration of the Bosch unit. Author

N76-22911*# Joint Publications Research Service, Arlington, Va.
PLANTS ABOARD A SPACECRAFT
V. Yazdovskiy and G. Rusakova Washington NASA May 1976 9 p Transl. into ENGLISH from Aviat. Kosmonavt. (USSR), no. 1, Jan. 1976 p 31-32
(NASA Order W-13183)
(NASA-TT-F-16980) Avail: NTIS HC $3.50 CSCL 06K

The use of plants in spaceship life support systems is discussed, and it is concluded that the difficulties involved in the use of higher plants (as opposed to, say, algae) can be solved. Author

N76-22912*# ILC Industries, Inc., Dover, Del.
APOLLO/SKYLAB SUIT PROGRAM MANAGEMENT SYSTEMS STUDY. VOLUME 2: COST ANALYSIS
30 Apr. 1974 58 p
(Contract NAS9-6100)
(NASA-CR-147587; SES-074-101-Vol-2) Avail: NTIS HC $4.50 CSCL 06K

The business management methods employed in the performance of the Apollo-Skylab Suit Program are studied. The data accumulated over the span of the contract as well as the methods used to accumulate the data are examined. Management methods associated with the monitoring and control of resources applied towards the performance of the contract are also studied and recommended upon. The primary objective is the compilation, analysis, and presentation of historical cost performance criteria. Cost data are depicted for all phases of the Apollo-Skylab program in common, meaningful terms, whereby the data may be applicable to future suit program planning efforts. Author

N76-22913*# Food and Drug Administration, Cincinnati, Ohio.
ECOLOGY AND THERMAL INACTIVATION OF MICROBES IN AND ON INTERPLANETARY SPACE VEHICLE COMPONENTS Quarterly Progress Report, 1 Jan. - 31 Mar. 1976
A. L. Reyes and J. E. Campbell May 1976 74 p refs
(NASA Order W-13411)
(NASA-CR-147198; QPR-44) Avail: NTIS HC $4.50 CSCL 06M

Almost 600 articles and books published since 1960 about microbial and viral inactivation are listed. This bibliography is presented to facilitate literature reviews on chemical, heat, and radiation inactivation of microorganisms and viral particles. Author

N76-22914* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

LOCKING MECHANISM FOR ORTHOPEDIC BRACES Patent Application
Jireh I-LeChao (Howard Univ.) and Charles H. Epps, Jr., inventors (to NASA) (Howard Univ.) Filed 14 Apr. 1976 15 p Sponsored by NASA
(NASA-Case-GSC-12082-1; US-Patent-Appl-SN-676958) Avail: NTIS HC $3.50 CSCL 06E

A locking mechanism for orthopedic braces is described which automatically prevents or permits the relative pivotable movement between a lower brace member and an upper brace member. The upper and lower brace members are provided with drilled bores within which a slidable pin is disposed, and depending upon the inclination of the brace members with respect to a vertical plane, the slidable pin will be interposed between both brace members. The secondary or auxiliary latching device includes a spring biased, manually operable lever bar arrangement which is manually unlatched and automatically latched under the influence of the spring. NASA

N76-22915# Institut fuer Informationsverarbeitung in Technik und Biologie, Karlsruhe (West Germany).
INFORMATION PROCESSING FOR SEVERAL SENSORY CHANNELS AND EFFECTORS, PART 1 Final Report [INFORMATIONSVERARBEITUNG BEI MEHREREN SINNESKANAELEN UND EFFEKTOREN, TEIL 1]
H. Uhlemann Nov. 1974 77 p refs In GERMAN
Avail: NTIS HC $5.00

The effect of acoustic support on a four channel visual manual compensatory control task upon control error was investigated. Tests with four channels show that no significant error reduction was obtained by acoustic support of a visual display. The improvements obtained are: facilitation of information update, especially for difficult tasks, and reduction of the frequency of necessary eye movements in the case of separated displays. The angle of separation was varied, and different control strategies were found for closely and widely spaced displays. ESA

N76-22916# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
CATALYSTS FOR A CESIUM BICARBONATE MEMBRANE CARBON DIOXIDE SCRUBBER Final Report, 1 Jul. 1973 - 30 Jun. 1974
John P. Allen Jun. 1975 67 p refs
(AF Proj. 6146)
(AD-A016471; AFFDL-TR-74-154) Avail: NTIS CSCL 07/4

Application studies of an alkaline membrane CO2 scrubber for future military self-contained aviators' oxygen systems indicated that a considerable improvement in CO2 scrubbing capacity would be needed. Alkaline membrane CO2 scrubbers had exhibited rather low operational effectiveness for CO2 control in closed-loop aviators' oxygen systems. Accordingly, catalytic alkaline materials were evaluated to determine whether CO2 permeation rates could be increased through the membranes. The materials evaluated were potassium tellurite, sodium selenite, sodium arsenite, sodium borate and 'Catacarb', a proprietary material used in acid gas scrubbing process in refineries. A special CO2 permeation apparatus was used to obtain data on permeation rates. Resulting data indicated that catalysis of varying degree occurred with some of the materials, particularly potassium tellurite. While no further efforts are planned on CO2 scrubbers for aircraft, the data is useful for future closed environment systems. GRA

N76-22917# National Bureau of Standards, Washington, D.C. Inst. for Basic Standards.
A MULTIPLE CHAMBER HUMIDITY APPARATUS Final Report
Lewis Greenspan Dec. 1975 22 p Sponsored by Army Natick Development Center
(PB-247655/4; NBSIR-75-917) Avail: NTIS HC $3.50 CSCL 06M

An apparatus has been developed for studying the growth of microbiological organisms on food under controlled conditions of humidity and temperature. The apparatus contains twenty eight individual humidity chambers within a temperature controlled

ath. A wide range of humidities can be provided within the dividual chambers by means of saturated salt solutions. These hambers can be maintained at stable temperatures from 5 to 0C with a constancy and uniformity within plus or minus .02 C. dividual chambers may be conveniently removed or changed ithout affecting the other chambers. GRA

176-22918# Southwest Research Inst., San Antonio, Tex.
MPACT TESTING OF ALLIED CHEMICAL INFLATABAND WITH DUMMIES AND HUMAN VOLUNTEERS, VOLUME 1
inal Report, 17 Feb. - 16 May 1975
ames M. Burkes, J. Robert Cromack, and Haskell Ziperman ct. 1975 23 p refs
Contract DOT-HS-4-00933)
PB-246119/2; DOT-HS-801738-Vol-1) Avail: NTIS IC $3.50 CSCL 13F

The objectives of the testing program were: (1) evaluate he effectiveness and performance of the inflataband restraint ystem as a viable method of occupant protection in a simuated head-on automotive crash, and (2) evaluate the kinematic erformance of anthropometric dummies and human volunteers nder simulated impact conditions when restrained by the nflataband. The program formulated to satisfy the objectives onsisted of 69 dynamic sled tests (30 dummy tests and 39 uman tests). Test results indicate that (1) the inflataband rovides acceptable restraint for the impact mode utilized and 2) that the dummy response to impact is more exaggerated han that observed with the human volunteers, but the discrepancies diminish with increasing impact severity. GRA

N76-22919# Southwest Research Inst., San Antonio, Tex.
IMPACT TESTING OF ALLIED CHEMICAL INFLATABAND WITH DUMMIES AND HUMAN VOLUNTEERS, VOLUME 2
Final Report, 17 Feb. - 16 May 1975
James M. Burkes, J. Robert Cromack, and Haskell Ziperman Oct. 1975 229 p refs
Contract DOT-HS-4-00933)
PB-246652/2; DOT-HS-801739-Vol-2) Avail: NTIS HC $8.00 CSCL 13F

Contents: Evaluation program (program plan, impact simulator, deceleration pulse, sled buck, primary restraint system, secondary restraint system, medical contingencies, instrumentation, program protocol, volunteer protocol, data reduction); operational problems; seat deterioration; dummy/human performance; restraint system performance; and medical observations. GRA

N76-22920# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A NON-CONSERVATIVE RETRIEVAL OF A TETHERED PASSIVE ASTRONAUT M.S. Thesis
Gary William Titmas Mar. 1975 72 p refs
(AD-A017182; GA/MC/74-9) Avail: NTIS CSCL 22/1

A non-conservative (angular momentum is not conserved) procedure is developed to safely retrieve a tethered passive astronaut on an extravehicular assignment (EVA). The safe retrieval of a tethered astronaut by conservative procedures has been shown to be impossible unless the conditions upon initiation of retrieval are exceptional. Safe recovery is defined as a max rotation rate of 0.5 rad/sec, a max impact velocity of 5.0 ft/sec, and a max centripetal acceleration of 8.0 ft/sec squared. This last requirement is treated by limiting the tether tension to 100.0 lb as the astronaut's mass is taken as 13.04 slugs. To ensure the max impact velocity is not exceeded, the astronaut is reeled in at a constant rate of 5.0 ft/sec. A safe recovery is achieved by insisting that the space vehicle 'track' the astronaut during the EVA. Then, when retrieval is initiated, a force is applied through the center of mass of the space vehicle to null the angular acceleration of the astronaut with respect to the space vehicle. GRA

N76-23087* California Univ., Berkeley. Lawrence Berkeley Lab.
QUANTITATIVE OBSERVATION OF LIGHT FLASH SENSATIONS EXPERIMENT MA-106
T. F. Budinger, C. A. Tobias, E. Schopper (Frankfurt Univ.), J. U. Schott (Frankfurt Univ.), R. H. Huesman, F. T. Upham, T. F. Wieskamp, J. M. Kucala, F. S. Goulding, D. A. Landis et al *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 16 p refs

CSCL 06P

Light flashes caused by the interaction of cosmic particles with the visual apparatus have been observed by astronauts on all space missions since Apollo 11. This Apollo Soyuz Test Project experiment compared measurements of the observer's visual sensitivity with measurements of the ambient radiation environment and with the frequency and character of the flashes observed. The data obtained reveal a latitude dependence of the frequency of observed flashes. This distribution of flashes is correlated with the distribution of cosmic particles with stopping power greater than 15 keV/ micrometers in the eye. The interaction of dark adaptation, specific ionization, and range of particles in the retina as factors in the visualization of particle passage is discussed. Author

N76-23088* Johann-Wolfgang-Goethe-Universitat, Frankfurt am Main (West Germany).
BIOSTACK 3 EXPERIMENT MA-107
H. Buecker, R. Facius, D. Hildebrand, G. Horneck, G. Reitz, U. Scheidemann, M. Schaefer, C. Thomas, B. Toth, A. R. Kranz et al *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 28 p refs

CSCL 06R

The Biostack III experiment onboard the Apollo spacecraft during the Apollo Soyuz Test Project complemented the Biostack I and II experiments of the Apollo 16 and 17 missions. The objectives of these experiments were to study the biological effects of individual heavy cosmic particles of high energy loss (HZE) not available on earth, to study the influence of additional space flight factors, to obtain knowledge on the mechanism by which HZE particles damage biological materials, to get information on the spectrum of charge and energy of the cosmic ions in the spacecraft, and to estimate the radiation hazards to man in space. Author

N76-23089* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ZONE-FORMING FUNGI EXPERIMENT MA-147
T. D. Rogers (Northrop Services, Inc., Houston, Tex.), G. R. Taylor, and M. E. Brower (Northrop Services, Inc., Houston, Tex.) *In its* Apollo-Soyuz Test Project Feb. 1976 12 p ref

CSCL 06M

Streptomyces levoris was used as an experimental microorganism during the Apollo Soyuz Test Project to study specific biological considerations that may be influenced by space flight factors. Preflight, inflight, and postflight growth rates of the cultures were compared by photographing the specimens at regular intervals. Preliminary results based on visual comparison of the photographic data indicate that an increased growth rate occurred during space flight in two of eight flight specimens. The increased growth rate continued in the two specimens during the postflight period until termination of the experiment. Radiation effects may be responsible for the absence of spores in two areas of the last spore ring that was formed during the inflight period in one of the flight cultures; however, the radiation studies related to this experiment have not been completed. Distinct morphological differences in spore rings were observed when postflight spore rings were compared with inflight spore rings. Factors that are related to space flight recovery and reentry into earth gravity may have effected these alterations. Author

N76-23090* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MICROBIAL EXCHANGE EXPERIMENT AR-002
G. R. Taylor, K. D. Kropp (Northrop Serv. Inc., Houston, Tex.), M. R. Henney (Northrop Serv. Inc., Houston, Tex.), S. S. Ekblad (Northrop Serv. Inc., Houston, Tex.), T. O. Groves (Northrop Serv.

Inc., Houston, Tex.), T. C. Molina (Northrop Serv. Inc., Houston, Tex.), J. G. Decelle (Northrop Serv. Inc., Houston, Tex.), C. F. Carmichael (Northrop Serv. Inc., Houston, Tex.), N. J. Gehring (Northrop Serv. Inc., Houston, Tex.), and E. L. Young (Northrop Serv. Inc., Houston, Tex.) *In its* Apollo-Soyuz Test Project Feb. 1976 31 p refs

CSCL 06M

Operational aspects associated with the experiment and the activities of medically important microorganisms recovered from the Apollo crewmen are evaluated. A variety of potential pathogens was recovered from each of the prime and backup crew members before and after flight. However, no disease events were reported. Candida albicans and Staphylococcus aureus were shown to be transferred from one crewmember to another during the flight. No other medically significant changes in the microbial population were observed. Author

N76-23091* Baylor Univ., Houston, Tex.
CELLULAR IMMUNE RESPONSE EXPERIMENT MA-031

B. S. Criswell *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 7 p refs

CSCL 06P

Significant changes in phytohemagglutinin (PHA) lymphocytic responsiveness occurred in the cellular immune response of three astronauts during the 9 day flight of the Apollo Soyuz Test Project. Parameters studied were white blood cell concentrations, lymphocyte numbers, B- and T-lymphocyte distributions in peripheral blood, and lymphocyte responsiveness to PHA, pokeweed mitogen, Concanavalin A, and influenza virus antigen. Author

N76-23092* Baylor Univ., Houston, Tex.
THE EFFECTS OF SPACE FLIGHT ON POLYMORPHONUCLEAR LEUKOCYTE RESPONSE EXPERIMENT MA-032

R. R. Martin *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 29 p refs

CSCL 06P

In a series of studies performed at intervals from 30 day before flight to 30 days after recovery, blood samples were obtained from the three astronauts of the Apollo Soyuz Test Project and from eight control subjects. To determine the effects of space flight on polymorphonuclear leukocytes, tests were performed on blood samples obtained as quickly as possible after splashdown and on the day following recovery. The astronauts' inhalation of propellant gases and the inception of corticosteroid therapy 1 day after recovery provided an additional opportunity to investigate the possible effects of these factors on leukocyte function. Data were obtained during each time period on the total leukocyte count, differential count, leukocyte adhesion, leukocyte migration and chemotaxis, phagocytosis, and histochemical staining for leukocyte acid and alkaline phosphatase. These observations present a variety of in vitro correlates to white blood cell function within the body. Taken together, they serve as a reasonable approximation of the effects of space flight on leukocyte function. Author

N76-23093* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
KILLIFISH HATCHING AND ORIENTATION EXPERIMENT MA-161

H. W. Scheld (Baylor Univ., Houston, Tex.), J. F. Boyd (Northrop Serv. Inc., Houston, Tex.), G. A. Bozarth (Northrop Serv. Inc., Houston, Tex.), J. A. Conner (Rice Univ.), V. B. Eichler (Wichita State Univ.), P. M. Fuller (Louisville Univ.), R. B. Hoffman, J. R. Keefe (Texas A and M Univ., College Station), K. P. Kuchnow (Bryn Mawr Coll.), and J. M. Oppenheimer (Mainz Univ.) *In its* Apollo-Soyuz Test Project Feb. 1976 14 p refs

CSCL 06C

The killfish Fundulus heteroclitus was used as a model system for study of embryonic development and vestibular adaptation in orbital flight. Juvenile fish in a zero gravity environment exhibited looping swimming activity similar to that observed during the Skylab 3 mission. Hatchings from a 336 hour egg stage were also observed to loop. At splashdown, both juveniles and hatchings exhibited a typical diving response suggesting relatively normal vestibular function. Juveniles exhibited swimming patterns suggestive of abnormal swim bladders. The embryos exhibited no abnormalities resulting from development in a zero gravity environment. Author

N76-23094* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ELECTROPHORESIS TECHNOLOGY EXPERIMENT MA-011

R. E. Allen, G. H. Barlow (Abbott Lab., Chicago, Ill.), M. Bier (Veterans Admin. Hospital, Tucson, Ari.), P. E. Bigazzi (State Univ. of New York, Buffalo), R. J. Knox (Oregon Univ., Portland), F. J. Micale (Lehigh Univ.), G. V. F. Seaman (Oregon Univ., Portland), J. W. Vanderhoff (Lehigh Univ.), C. J. VanOss (State Univ. of New York, Buffalo), W. J. Patterson et al. *In* Apollo-Soyuz Test Project Feb. 1976 23 p refs

CSCL 06F

Experiment MA-011, electrophoresis technology, was designed to test electrophoresis hardware that would continue the development of technology for electrophoretic separation of materials in the near zero g environment of space. The experimental hardware generally functioned as planned. Frozen live cells were successfully transported into space, electrophoretic processing was performed, and viable cells were returned to earth. A separation of the three types of fixed red blood cells (rabbit, human, and horse) was demonstrated. The human lymphocytes, however, showed no apparent migration. The separation of human kidney cells produced the most exciting data. Analysis shows electrophoretic separation throughout the entire column with at least four bands of viable cells. The isotachophoresis experiment definitely demonstrated the isotachophoretic separation of biological cells in a near zero g environment. Author

N76-23095* Max-Planck-Institut fuer Biochemie, Martinsried bei Muenchen (West Germany).
ELECTROPHORESIS EXPERIMENT, EXPERIMENT MA-014

K. Hannig and H. Wirth *In* NASA. Lyndon B. Johnson Space Center Apollo-Soyuz Test Project Feb. 1976 16 p ref

CSCL 06F

A continuous, free flow electrophoresis study was conducted during the Apollo Soyuz Test Project mission to investigate and evaluate the increase in sample flow rate and sample resolution achievable in space. The electrophoresis equipment was designed for the separation of four mixtures of biological cells with variable sample flow rates, buffer flow rates, and electric field gradients. Separation quality was assessed by measuring the light from a quartz lamp through the electrophoresis channel and on to a photodiode system. The preliminary results indicate that all monitored systems operated correctly during the experiment. The optical system produced a light that was too bright to discern true cell distributions, but data were received that show a distribution of separated cells. Author

N76-23607 Ohio State Univ., Columbus.
SURVEY OF THEORETICAL AND EXPERIMENTAL MECHANICS APPLIED TO HEAD INJURY

Ali E. Engin and Ann W. Engin *In* Shock and Vibration Inform. Center (Defense) The Shock and Vibration Dig., Vol. 7, No. 3, 1975 Mar. 1975 p 78-90 refs

Some of the theoretical and experimental mechanics investigations applied to the head injury problem were presented. The treatment was divided into the following sections: (1) studies dealing directly with analytical modelling of head impact, (2) theoretical and experimental studies on determination of

mechanical properties of the constituents of the head, (3) experimental studies conducted on skulls of cadavers, live and dead animals and artificial models. Author

N76-23819 British Library Lending Div., Boston Spa (England).
CHANGE IN VARIOUS CHEMICAL AND PHYSICAL PROPERTIES OF NATURAL WATERS ON PROLONGED STORAGE
B. A. Skopintsev Jan. 1976 27 p refs Transl. into ENGLISH from Gidrokhim. Mater. (USSR), v. 17, 1950 p 108-124
(BLL-RTS-9254A) Avail: British Library Lending Div., Boston Spa, Engl.: £5.00; 20 BLL photocopy coupons

Changes in various chemical and physical properties of natural waters which take place during prolonged storage in the dark under aerobic conditions were studied. Mineral derivatives of nitrogen and phosphorus increased and dissolved oxygen decreased, basically due to biochemical decomposition. The ratio of the growth in mineral N/P and the ratio of the oxygen consumed (BOD) to the nitrate nitrogen and phosphate phosphorus formed were calculated; the resulting values of oxygen equivalents were within the limits of boundary values calculated on the basis of the content of organic C, N, and P. Changes in BOD overtime were studied, giving an idea of the consumption of oxygen in the oxidation of stable organic compounds. Alterations in the color of the water and increases in transparency were also observed. In addition, dialysis experiments were conducted to study the nature of humic compounds contained in the water. Author

N76-23820 British Library Lending Div., Boston Spa (England).
ON THE INFLUENCE OF DISSOLVED CARBON DIOXIDE ON BIOSYNTHETIC PROCESSES
T. S. Sherstobitova and E. S. Bylinkina 1975 15 p refs Transl. into ENGLISH from Antibiotiki (USSR), v. 20, no. 3, 1975 p 275-281
(BLL-TPI-Trans-0876-(9056.525)) Avail: British Library Lending Div., Boston Spa, Engl.

To aid in the investigation of the influence of dissolved carbon dioxide on biosynthetic processes, a number of techniques were devised for the determination of the concentration of bicarbonate ions in the medium, the overall rate constant for the evolution of carbon dioxide, and other factors. D.M.L.

N76-23821# Israeli Program for Scientific Translations Ltd., Jerusalem
ARTIFICIAL AND NATURAL RADIONUCLIDES IN MARINE LIFE
V. G. Tsytsugina, N. S. Risik, G. E. Lazorenko, and B. G. Polikarpov, ed. 1975 120 p refs Transl. into ENGLISH of the book "Iskusstvennye i estestvennye radionuklidy v zhizni Gidrobiontov" Kiev, Nauk Dumka, 1973 120 p Sponsored by US-Israel Binatl. Sci. Found.
(TT-75-50010; ISBN-0-7065-1509-9) Copyright. Avail: NTIS HC $5.50

The karyological and radiation cytogenetics of marine fish were studied along with the effects of radionuclides on their chromosomes. The accumulation and microdistribution of uranium in marine organisms, and the extraction of radionuclides by alginic acid are discussed. F.O.S.

N76-23822*# Old Dominion Univ. Research Foundation, Norfolk, Va.
MEASUREMENT OF TRANSPIRATION IN PINUS TAEDA L. AND LIQUIDAMBAR STYRACIFLUA L. IN AN ENVIRONMENTAL CHAMBER USING TRITIATED WATER
Gerald F. Levy, Daniel E. Sonenshine, and Joan K. Czoch May 1976 26 p refs
Grant NGL-47-003-067)
(NASA-CR-147924; PGSTR-BAP76-32) Avail: NTIS HC $4.00 CSCL 06C

Transpiration rates of loblolly pine (Pinus taeda L.) and sweetgum (Liquidambar styraciflua L.) were measured at two different atmospheric water vapor pressure deficits (V.P.D.) in a controlled environment growth chamber using tritiated water as a tracer. The trees were maintained in a sealed plant bed containing a hydroponic nutrient solution into which labeled water (spike) was introduced. Samples of leaves, chamber air, spiked nutrient solution and control water were assayed for ratio-activity using liquid scintillation techniques to determine transpiration rates. The transpiration rate of sweetgum in ml./hr./gm. (4.95) was found to be 5 times greater than that of loblolly pine (1.03) at 1.84 V.P.D. and 8 times greater at 6.74 V.P.D. (15.99 for sweetgum vs. 2.19 for pine). Transpiration (based on measurements of leaf radioactivity) in both species rose with increasing deficit; however sweetgum increased its output by 3 times while pine only doubled its rate. Cyclical changes in transpiration rates were noted in both species; the sweetgum cycle required a 6 hour interval whereas the pine cycle required a 9 hour interval. Author

N76-23823# Civil Aeromedical Inst., Oklahoma City, Okla.
INTERACTION BETWEEN MARIJUANA AND ALTITUDE ON A COMPLEX BEHAVIORAL TASK IN BABOONS
Mark F. Lewis, Douglas Peter Ferraro (New Mexico Univ., Albuquerque), Henry W. Mertens, and JoAnn Steen Aug. 1975 6 p refs
(AD-A020680/5; FAA-AM-75-6) Avail: NTIS HC $3.50 CSCL 06/15

The effects on performance of any interaction between hypoxia and marijuana were studied. Two baboons were trained to perform on a delayed matching-to-sample task at ground level and altitudes of 8,000 and 12,000 feet. The animals were orally administered doses of marijuana ranging from 0.25 to 2.0 mg/kg, 2 hours prior to experimental sessions at each altitude. No effects on accuracy of matching performance were observed for any of the drug doses or altitudes used. Amount of work output was markedly reduced by the higher drug doses at the 8,000 and 12,000-feet altitudes. This interaction suggests that the behavioral impairment produced by marijuana can be potentiated by hypoxia. Author

N76-23824*# Boeing Co., Houston, Tex.
DEVELOPMENT OF A CHEMILUMINESCENT AND BIOLUMINESCENT SYSTEM FOR THE DETECTION OF BACTERIA IN WASTEWATER EFFLUENT Quarterly Report, Sep. - Dec. 1975
Richard R. Thomas 1975 50 p refs
(Contract NAS5-22545)
(NASA-CR-144750; Rept-1) Avail: NTIS HC $4.00 CSCL 06B

Automated chemiluminescent and bioluminescent sensors were developed for continuous monitoring of microbial levels in wastewater effluent. Development of the chemiluminescent system included optimization of reagent concentrations as well as two new techniques which will allow for increased sensitivity and specificity. The optimal reagent concentrations are 0.0025 M luminol and 0.0125 M sodium perborate in 0.75N sodium hydroxide before addition of sample. The methods developed to increase specificity include (1) extraction of porphyrins from bacteria collected in a filter using 0.1N NaOH - 50 percent Ethanol, and (2) use of the specific reaction rate characteristics for the different luminol catalysts. Since reaction times are different for each catalyst, the reaction can be made specific for bacteria by measuring only the light emission from the particular reaction time zone specific for bacteria. Developments of the bioluminescent firefly luciferase system were in the area of flow system design. Author

N76-23825# Pacific Northwest Environmental Research Lab., Corvallis, Ore.
PROCEEDINGS: BIOSTIMULATION/AND/NUTRIENT ASSESSMENT WORKSHOP Ecological Research Series.
Jun. 1975 325 p refs Workshop held at Corvallis, Oreg., 16-17 Oct. 1973
(PB-247229/8; EPA-660/3-75-034) Avail: NTIS HC $9.75 CSCL 06F

The workshop was held to bring together those investigators in the Environmental Protection Agency who are actively engaged in research relating to biostimulation and nutrient assessment to present the results of their studies. The papers presented

were concerned with the results of algal assays conducted on various waters and wastes to determine their biostimulatory effects as well as the results of other research relating to the assessment of nutrients and their effects on the aquatic ecosystem. GRA

N76-23826# Life Systems, Inc., Cleveland, Ohio.
ENZYME ALARM CHARACTERIZATION STUDIES Final Report, 10 Feb. - 30 Nov. 1975
Ronald J. Davenport and Tom S. Steenson Dec. 1975 46 p refs
(Contract DAAA15-75-C-0032)
(AD-A018761; LSI-ER-76037; ED-CR-234-6) Avail: NTIS CSCL 15/2

The performance of the Enzyme Alarm was characterized in order to obtain data useful for increasing the speed of alarm response to large quantities of toxic agents. The response time of the alarm was measured when the enzyme inactivation by agents was chemically simulated. The effect on alarm response time of changes in applied cell current, enzyme substrate, anode materials, and electrode orientation was quantified. Platinum (Pt) and pyrolytic graphite anodes were studied. Conclusions and recommendations are given. GRA

N76-23827 West Virginia Univ., Morgantown.
A COMPREHENSIVE ANALYSIS OF HEAD AND NECK DYNAMICS ARISING FROM IMPACT AND INERTIA FORCES Ph.D. Thesis
Jeffery Charles Huston 1975 247 p
Avail: Univ. Microfilms Order No. 76-11767

The development of a three-dimensional rigid body dynamics model of the human head and neck region is presented. This model predicts the center of mass displacements, velocities, and accelerations of the head and neck resulting from high impulsive and inertial forces. Key anatomical components such as intervertebral discs, ligaments, and muscles are incorporated into the model. Joint stopping mechanisms are also included to limit the model's range of motion. Any number up to six degrees of freedom can be specified at each joint. This allows for simulation of both a simple hinge-type joint such as the jaw or a more complicated joint as found between two vertebrae. The developed model has the ability to predict head and neck motion and injury as well as any experimental method without the high expenses involved. Dissert. Abstr.

N76-23828 British Library Lending Div., Boston Spa (England).
METHODS FOR THE DETECTION OF DISTURBANCES IN THE LIVING BODY
M. Kimura Dec. 1975 24 p refs Transl. into ENGLISH from Sogo Rinsho (Japan), v. 23 no. 1, 1974 p 107-116
(BLL-RTS-9632) Avail: British Library Lending Div., Boston Spa, Engl.: £10.00; 40 BLL photocopy coupons

Clinical methods for analyzing toxic substances from pollutants which cause human disorders and affect public health (i.e., occupational diseases) are examined. Urine and blood tests for lead pollutants are examined and the mechanisms by which lead affects enzyme biochemistry (i.e., hemoglobin synthesis) are discussed. Methods for determining cadmium toxicity by urine tests are outlined (i.e., proteins found in urine are analyzed on a molecular weight basis). Various analytical techniques used in the biochemical analysis of proteins (i.e., gel filtration, electrophoresis) are examined. A listing of the enzymes affected by mercury, lead, and cadmium in experimental animals (rats, mice, rabbits etc.) is given. J.R.T.

N76-23829 British Library Lending Div., Boston Spa (England).
BACKACHE IN HELICOPTER PILOTS. ANALYSIS, ETIOLOGY, TREATMENT AND PREVENTION
R. Sliosberg Sep. 1975 12 p Transl. into ENGLISH from Rept. and Commun. of the Intern. Aeron. and Cosmonautical Med. Congr., 11th Congr. in Europe (Madrid), 1962 p 145-151
(BLL-RAE-Lib-Trans-1857-(5207)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

Spinal complaints in 128 helicopter pilots, all of whom had at least 500 hours experience were examined. It was shown that 87.5% suffered from spinal pain when flying, the majority in the lumbar region. However the incidence of cervical and thoracic spinal pain was also high. Classically these complaints start after approximately 300 hours flying and were more likely to occur if the previous intensity of flying had been high. Once established the affected pilots suffered back pain on all but the shortest flights. The main aetiology of the condition was twofold: the posture adopted by the pilot to fly the helicopter and the relatively high vibration levels present in helicopters. It is considered that the incidence and seriousness of the problem can be reduced by a variety of measures described in this report. Author

N76-23830 Yale Univ., New Haven, Conn.
STUDY OF THE ACTION OF HUMAN KB CELL RIBONUCLEASE NU AND ESCHERICHIA COLI RIBONUCLEASE P Ph.D. Thesis
Alfred Lester Meador Bothwell 1975 177 p
Avail: Univ. Microfilms Order No. 76-11246

Ribonuclease activities found in extracts of human KB cells were studied and compared with Escherichia coli RNases. RNase NU was partially purified from human cells and characterized. Detailed information concerning the RNA structure and sequence recognized by RNase NU was obtained from studying cleavage reactions on natural RNAs of known nucleotide sequence. Other investigations indicate that RNase P functions in vivo to process RNA precursor. Therefore, the function of RNase P in vivo is not restricted to transfer RNA biosynthesis. The sequence of the extra nucleotides found in the precursor were determined with the aid of RNase P and RNase NU. Studies of the Escherichia coli RNase P cleavage reaction on several well-defined RNA substrates also revealed aspects of secondary and tertiary structure which are important for RNase P-substrate recognition. A model is presented for two types of RNase P-substrate interaction. Dissert. Abstr.

N76-23831 Texas Univ. Health Science Center, Dallas.
THE STRESS PHONOCARDIOGRAM Ph.D. Thesis
Stuart Alonzo Bergman, Jr. 1975 142 p
Avail: Univ. Microfilms Order No. 76-11832

The phonocardiogram was used during stress testing to evaluate its usefulness as an adjunct to the modern exercise test electrocardiogram. It was reasoned that if heart sounds reflect cardiac mechanical behavior, their recording during stress by phonocardiography may document ventricular dysfunction not apparent at rest. After appropriate recording system and stress protocols were established, a series of experiments were conducted - first on animals; then on normal volunteers; and finally on patients with coronary artery disease. First heart sound amplitude is sensitive to changes in myocardial performance and follows peak left ventricular pressure rise in magnitude and direction over a wide range of contractile states. The stress phonocardiogram appears to be a useful adjunct to the evaluation of patients with latent ventricular dysfunction, especially that associated with coronary heart disease, but also to physiological derangements which alter ventricular performance. Dissert. Abstr.

N76-23832 California Univ., Santa Barbara.
THE EFFECTS OF PROLONGED ACUTE HYPOZIA ON CORONARY BLOOD FLOW, MYOCARDIAL METABOLISM AND CARDIOVASCULAR DYNAMICS Ph.D. Thesis
Julian Frank Borgia 1975 240 p
Avail: Univ. Microfilms Order No. 76-9880

Anesthetized intact dogs were exposed for 75 minutes to either 5.75, 9.0 or 12.0 per cent oxygen in nitrogen. Control subjects were exposed to 21 per cent O2 for the same duration and all responses were compared over time by multifactorial analysis of variance. Cardiac index (CI) significantly increased only during severe hypoxia (5.75 per cent O2); however, the elevation CI did not occur until 30 minutes after the onset of hypoxia. Thereafter, cardiac index decreased as a consequence of a gradual increase in arterial hemoglobin concentration (and oxygen carrying capacity), which averaged 26 per cent above controls at 75 minutes. Although heart rate initially increased during hypoxia, the elevation in CI occurred exclusively through

ugmentation of stroke volume. Pulmonary hypertension was bserved at all levels of hypoxia. Conversely, a statistically gnificant increase in systemic arterial pressure occurred during e initial 15 minutes of exposure to 5.75 per cent O2; and, ereafter, was reduced to control levels. Dissert. Abstr.

76-23833 Colorado Univ., Boulder.
MATHEMATICAL MODEL OF THE HUMAN SPINE AND TS APPLICATION TO THE CERVICAL SPINE
h.D. Thesis
ung Won Hong 1975 207 p
vail: Univ. Microfilms Order No. 76-11585

A direct method which is a nonlinear procedure to deal ith the natural nonlinear problems directly is developed for odeling the human spine. The nonlinearities of material and eometrical factors are also directly included in the model ithout any linearization process to approximate the mathematical xpressions. The computational technique using the digital omputer has been emphasized to solve the large-scale nonlinear quations effectively for the spinal model. The Newton-Raphson nd the modified Newton-Raphson methods have been used nd the PROGRAM SPINE1 and PROGRAM SPINE2 are the esults. This spinal model is then applied to analyze the isplacement of the cervical spine because of its variety of motion nd integrity in its anatomy. Various techniques of computer raphics are discussed to make efficient display of the behavior f the model. Dissert. Abstr.

N76-23835 Vermont Univ., Burlington.
AN INSTRUMENT FOR MICROSCOPICAL OBSERVATION OF THE BIOPHYSICAL EFFECTS OF ULTRASOUND
Ph.D. Thesis
Douglas Lawrence Miller 1976 112 p
Avail: Univ. Microfilms Order No. 76-11867

The microscopical observation of test objects under ultrasonic radiation has been a fruitful method of studying biophysical effects of ultrasound. An instrument was constructed with two 1.0 in. diameter quartz discs, a driver which was thickness resonant at 1.0 MHz, and a thin cover concentrically mounted on the stage of a microscope. General observations of the test space included descriptions of acoustic streaming, low frequency surface waves and acoustic cavitation. A study was made of the migration of 45 micrometer diameter polystyrene spheres suspended in water, and substantial agreement was found between photographically determined particle velocities and velocities calculated from radiation force theory applied to the calibrated field.
Dissert. Abstr.

N76-23836*# Scientific Translation Service, Santa Barbara, Calif.
ERYTHROPOIETIC PROPERTIES OF PLASMA IN HYPODYNAMIA
M. M. Shcherba, O. I. Moiseyeva, A. M. Volzhskaya, and Ye. N. Glazunov Washington NASA May 1976 12 p refs Transl. into ENGLISH from Fiziologicheskiy zh. SSSR (USSR), v. 61, no. 12, 1975 p 1825-1830
(Contract NASw-2791)
(NASA-TT-F-17019) Avail: NTIS HC $3.50 CSCL 06P

Hypodynamia reduces the amount of erythropoietin in plasma, and as a result, in the majority of subjects (16 out of 21) the erythropoiesis inhibitor was detected on the 8th day of motor activity limitation. The erythropoietic properties of plasma are of the same type in control and recovery periods, which indicates a high level of production of erythropoietin during readaptation.
Author

N76-23837*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
IMPROVED TISSUE MACERATING INSTRUMENT Patent Application
E. F. Baehr and J. E. Burnett, inventors (to NASA) Filed 15 Apr. 1976 9 p
(NASA-Case-LEW-12668-1; US-Patent-Appl-SN-677353) Avail: NTIS HC $3.50 CSCL 06B

A surgical-tissue macerating and removal tool is reported that lies a rotating rod with a cutting member at one end. The device is placed in a tube which itself is disposed coaxially in an extension of the tool handle. A frusto-conical member extends into the extension at the cutter member end of the rotating rod with its small end engaging the tube. The portion of the frusto-conical member outside of the extension forms a tissue engaging member and may be cut off at an angle of the axis of the rod to form a tissue engaging edge. Apertures are provided in the extension adjacent the frusto-conical member so that treatment fluid supplied in the annular space between the tube and the extension may flow to the operative site. An aperture is provided in the frusto-conical member between the extension and the tube so that fluid may also flow into the tube where it mixes with macerated tissue being directed through an aperture in the tube to a passageway which may have suction applied thereto to help remove macerated material.
NASA

N76-23838# Civil Aeromedical Inst., Oklahoma City, Okla.
PILOT PERFORMANCE AND HEART RATE DURING IN-FLIGHT USE OF A COMPACT INSTRUMENT DISPLAY Final Report
Howard A. Hasbrook, Paul G. Rasmussen, and David M. Willis Nov. 1975 13 p refs
(AD-A021519/4; FAA-AM-75-12) Avail: NTIS HC $3.50 CSCL 01/2

An in-flight study of pilot performance was conducted while using an experimental instrument display. The display was used in flight by low time and high time professional pilots. The major findings of this study indicate that pilot performance with the high contrast instrument display, which employs a vertical and horizontal format and occupies substantially less space than conventional instruments, is equal to pilot performance with conventional instruments, in spite of little familiarization time and without regard to pilot experience. No difference in stress (as measured by heart rate) was evident between experimental and conventional displays. Subjective reaction of the pilot subjects to the new type display was favorable. Panel space requirements can be reduced by at least 25 percent by use of the design concepts outlined in this study.
Author

N76-23839# Civil Aeromedical Inst., Oklahoma City, Okla.
STRESS IN AIR TRAFFIC CONTROLLERS: COMPARISON OF TWO AIR ROUTE TRAFFIC CONTROL CENTERS ON DIFFERENT SHIFT ROTATION PATTERNS Final Report
C. E. Melton, R. C. Smith, J. M. McKenzie, J. T. Saldivar, S. M. Hoffmann, and P. R. Fowler Sep. 1975 12 p refs
(AD-A020679/7; FAA-AM-75-7) Avail: NTIS HC $3.50 CSCL 05/10

Stress in 23 air traffic controllers (ATCS) at Atlanta Air Route Traffic Control Center (ATL) on the straight 5-day shift rotation schedule was compared with stress in 23 ATCS's on the 2-2-1 shift rotation schedule at Fort Worth Air Route Traffic Control Center (FTW). Stress in six other FTW ATCS's on the 5-day schedule was compared to stress in their 23 cohorts on the 2-2-1 schedule. Stress estimates were made from urinary levels of 17-ketogenic steroids (st), epinephrine (e), and norepinephrine (ne). Levels of st and ne were significantly higher for ATL ATCS's under all conditions. Ranking by composite stress index (C sub s) of ATC facilities showed that ATL ranked third and FTW, ninth. When C sub s was calculated for shifts, FTW ranked last in stressfulness on all shifts. ATL ranked fifth on the day shift and second on the evening shift. It is concluded that physiological stress at ATL is significantly greater than at FTW. The difference probably cannot be accounted for by the shift schedules, since stress in the group at FTW on the 5-day schedule does not differ significantly from stress in their cohorts on the 2-2-1 schedule.
Author

N76-23840# Civil Aeromedical Inst., Oklahoma City, Okla.
FUNCTIONAL STRENGTH OF COMMERCIAL AIRLINE STEWARDESSES
Herbert M. Reynolds and Mackie A. Allgood Nov. 1975 16 p
(AD-A021836/2; FAA-AM-75-13) Avail: NTIS HC $3.50 CSCL 06/16

Data from 13 body measurements and 4 strength tests on 152 female flight attendants are reported herein. The stewardesses

are taller and lighter than the corresponding age in the civilian population. The strength tests are reported as the average plateau, maximum force, and pound/second force for a two handed push, leg lift, back lift, and arm lift. There are no comparable data in the literature; thus, these data can provide a general guideline as to the maximum strength capabilities of the on-line airline stewardess.
Author

N76-23841# Civil Aeromedical Inst., Oklahoma City, Okla.
THE EFFECTS OF DEXTROAMPHETAMINE ON PHYSIOLOGICAL RESPONSES AND COMPLEX PERFORMANCE DURING SLEEP LOSS Final Report
E. A. Higgins, W. D. Chiles, J. M. McKenzie, P. F. Iampietro (AFOSR, Arlington, Va.), J. A. Vaughan, G. E. Funkhouser, M. J. Burr, A. E. Jennings, and G. West Nov. 1975 12 p refs
(AD-A021520/2; FAA-AM-75-14) Avail: NTIS HC $3.50 CSCL 06/15

On two separate occasions, performance of 10 male subjects was measured on the Civil Aeromedical Institute Multiple Task Performance Battery at 4-hour intervals for a period of 24 hours without sleep. Each subject received a capsule at 4-hour intervals beginning at 2000. On one occasion, the first three doses contained 5 mg each of dextroamphetamine sulfate followed by placebos for the remaining three capsules. On the other occasion, all capsules were placebos. Results of the experiment demonstrated that the dextroamphetamine sulfate sustained a high level of proficiency and alertness and delayed the effects of fatigue for 8 to 12 hours after the ingestion of the third and final drug capsule. Heart rate, rectal temperature, and urinary excretion rates of catecholamines were elevated with this drug. These increases could support the enhancement of proficiency and alertness demonstrated with amphetamines. Neither the subjects' feelings of fatigue nor the accuracy of their estimates of performance capabilities differed significantly in these two test conditions.
Author

N76-23842# California Univ., Livermore. Lawrence Livermore Lab.
EFFECTS OF ELECTROMAGNETIC FIELDS BELOW 30 MHz ON ANIMAL BIOLOGY
J. H. Pierluissi (Texas Univ., El Paso) 15 Aug. 1975 16 p refs
(Contract W-7405-eng-48)
(UCRL-51880) Avail: NTIS HC $4.00

The literature describing the effects of radio frequency (rf) electromagnetic fields on animal biology is reviewed. Also, a table is provided which summarizes organic (nonthermal) effects on various biological organisms as found by 30 researchers.
Author (ERA)

N76-23843# Joint Publications Research Service, Arlington, Va.
REACTION OF THE ATPase ACTIVITY OF THE ACTION OF DENSELY AND SPARSELY IONIZING RADIATIONS
V. M. Andrianov, E. E. Chebotarev, P. N. Kulyabko, and I. A. Roiter 1975 181 p refs Transl. into ENGLISH from Radiobiologiya (Moscow), v. 15, no. 2, 1975 p 171-328 Sponsored by ERDA
(ERDA-TR-51) Avail: NTIS

Whole-body irradiation of animals with fast neutrons and X rays disrupts the ATPase activity in liver tissues. The difference in the action of these types of ionizing radiations lies in the fact that during the first hours after irradiation with fast neutrons, the ATPase activity is suppressed chiefly in the nuclei of the hepatocyte, and after X irradiation in the cytoplasm.
Author (ERA)

N76-23844# MAN-Acoustics and Noise, Inc., Seattle, Wash.
REVIEW OF STUDIES INVESTIGATING HUMAN RESPONSE TO COMMERCIAL AIRCRAFT NOISE Final Report
Nov. 1975 156 p refs
(Contract DOT-FA74WAI-439)
(AD-A022356/0; MAN-1011B; FAA-RD-75-182) Avail: NTIS HC $6.75 CSCL 06/19

Empirical studies involving human response to commercial aircraft/airport noise are reviewed. The review was limited to studies that involved response to actual or recorded flyover signals of conventional takeoff and landing (CTOL) aircraft. Study methods identified were laboratory, field studies, social survey approach, complaint studies, damage risk, interference type studies, and combination methods.
Author

N76-23845# Minnesota Univ., Minneapolis. Dept. of Psychology.
A STUDY OF COMPUTER-ADMINISTERED STRADAPTIVE ABILITY TESTING
C. David Vale and David J. Weiss Oct. 1975 52 p refs
(Contract N00014-67-C-0113-0029; NR Proj. 150-343; RR0420401)
(AD-A018758; RR-75-4) Avail: NTIS CSCL 05/10

A conventional vocabulary test and two forms of a stradaptive vocabulary test were administered by a time-shared computer system to undergraduate college students. The two stradaptive tests differed in that one counted question mark responses (i.e., omitted items) as incorrect and the other ignored items responded to with question marks. Analysis of difficulties of items associated with correct, incorrect, and question mark responses suggested that items with question mark responses should not be ignored, but should be treated as incorrect responses in branching decisions. Suggestions for future research on the stradaptive testing model are made.
GRA

N76-23846# Navy Personnel Research and Development Center, San Diego, Calif.
A COMPARISON OF ADAPTIVE AND NONADAPTIVE TRAINING STRATEGIES IN THE ACQUISITION OF A PHYSICALLY COMPLEX PSYCHOMOTOR SKILL Interim Report, Jul. 1974 - Jul. 1975
James A. Riedel, Macy L. Abrams, and David Post Dec. 1975 37 p refs
(PF55522004)
(AD-A018880; NPRDC-TR-76-24) Avail: NTIS CSCL 05/9

The relative effectiveness of using adaptive and nonadaptive (fixed) strategies to facilitate acquisition of a physically complex psychomotor skill was investigated. In addition, task and practice difficulty levels were studied. Sixty subjects were each given pre- and post-training tests, and the data were evaluated by analysis of covariance. Results suggest no significant difference between fixed and adaptive techniques for the skill studied. The results are discussed and recommendations made. Author (GRA)

N76-23847 British Library Lending Div., Boston Spa (England).
MAXIMUM FORCES EXERTED BY MEN IN THE ZONE OF MOVEMENT OF THE ARMS AND LEGS
W. Rohmert Sep. 1975 34 p refs Transl. into ENGLISH from Forschungsber. des Landes Nordrhein-Westfalen (West Germany), no. 1616, 1966
(BLL-RAE-Lib-Trans-1839-(5207)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

Maximum force measurements are carried out on five students in the zone of movement of the arms in the six coordinate directions and for both rotational directions, as well as in the zone of movement of the legs as maximum foot forces in the plane of symmetry of the body. The results are summarized in a biometric atlas using plotted isodynes. The accuracy of force measurements is discussed. In order to present the individual scatter in the position of the isodynes, the results are compared with earlier random investigations on a group of 60 students.
Author

N76-23848*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PLANETARY QUARANTINE Semiannual Review, 1 Jul. - 30 Dec. 1975
18 Apr. 1976 127 p refs
(Contract NAS7-100)
(NASA-CR-147933; JPL-900-732) Avail: NTIS HC $6.00 CSCL 06M

The overall objective is to identify those areas of future missions which will be impacted by planetary quarantine (PQ) constraints. The objective of the phase being described was to develop an approach for using decision theory in performing a PQ analysis for a Mariner Jupiter Uranus Mission and to compare it with the traditional approach used for other missions. Author

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